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Enoplotrupes (Enoplotrupes) tawangensis sp. nov. (Coleoptera: Geotrupidae) from Arunachal Pradesh (India) and Bhutan, along with a key to its relatives

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ABSTRACT

Enoplotrupes (Enoplotrupes) tawangensis sp. nov. (Coleoptera: Geotrupidae) from district Tawang (Arunachal Pradesh state, India) and Bhutan is described, diagnosed, and illustrated. The new species is compared with similar and probably closely related species *E. (E.) rhinoceros* Král, Malý & Schneider. A key to the genus *Enoplotrupes* P. H. Lucas known from India is provided.

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Introduction

The genus *Enoplotrupes* P.H. Lucas, 1869 includes 20 described species which are distributed in China, India, Myanmar, Thailand, and Vietnam (Boucomont 1905; Löbl et al. 2006; Král et al. 2012; Nikolajev et al. 2016; Ochi et al. 2017; Schoolmeesters 2018). The genus is classified into tribe Enoplotrupini and can be differentiated from other genera of family Geotrupidae by male genitalia with phallobase and parameres usually completely symmetrical in shape, presence of a well developed long fronto-clypeal horn (males), and pronotum armed in anterior third with bifurcate or simple horn in males or with markedly developed transverse carina or bi-tuberculate short prominences in females and smaller males (Boucomont 1905; Král et al. 2012; Ochi et al. 2017). The genus is divided into three subgenera: *Enoplotrupes* P. H. Lucas, 1869, *Gynoplotrupes* R. Oberthür, 1883, and *Tyrannotrupes* Král et al. 2012 (Boucomont 1905; Zunino 1984; Král et al. 2012). The subgenera of the genus can be delimited mainly by the shape of the clypeo-frontal and pronotal horns and male genitalia (Boucomont 1905; Zunino 1984; Král et al. 2012). Previously, three species (now four) of *Enoplotrupes* are known from India: *Enoplotrupes (E.) splendens* Rothschild and Jordan 1893 (India: Manipur, Nagaland, Punjab; Western

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Myanmar), *E. (E.) rhinoceros* Král et al. 2012 (India: Arunachal Pradesh; Myanmar), and *E. (Gynoplotrupes) bieti bieti* R. Oberthür, 1883 (India: Sikkim, Uttarakhand; Bhutan, China) (Rothschild and Jordan 1893; Boucomont 1905; Löbl et al. 2006; Král et al. 2012; Nikolajev et al. 2016; Schoolmeesters 2018).

When working on the Geotrupidae collection in the Zoological Survey of India, Kolkata (ZSCI), we discovered six specimens of a new species belonging to the genus *Enoplotrupes*. Another material from Bhutan studied by one of the authors (D.K.) proved to be conspecific with the material from Arunachal Pradesh. The purpose of this paper is to describe, illustrate, and diagnose this new species. Relevant diagnostic characters of the new species of this genus are illustrated (Figs 1–3) and compared with probably closely related species, *E. (E.) rhinoceros* (Table 1).

Material and methods

The material of the new species was collected at Tawang district, Arunachal Pradesh state, India, during expeditions to document the fauna of state of Arunachal Pradesh, India in 2009 and 2018. The specimens are dry and pinned. The aedeagus was dissected and kept in 10% KOH for 30 minutes to clear the hard sclerotised structures. The specimens were studied using a Leica M205A stereomicroscope. The photographs were taken through the microscope using the proprietary software (Leica application suite, V3.8). The specimens bear a red printed label: ‘*Enoplotrupes (Enoplotrupes) tawangensis* sp. nov., HOLOTYPE [or PARATYPE], Devanshu Gupta, Kailash Chandra & David Král det. 2019’.

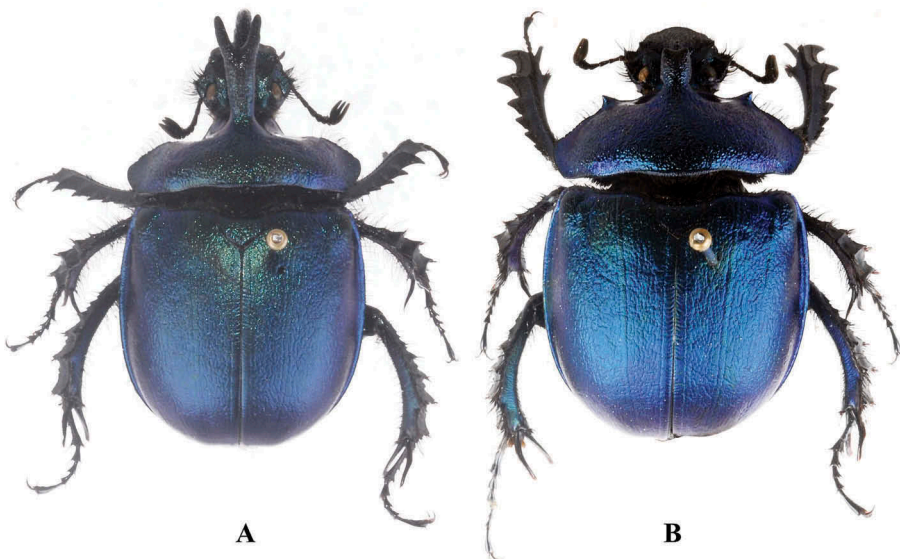


Figure 1. A-B. Habitus, dorsal view of *Enoplotrupes (E.) tawangensis* sp. nov. m., holotype: A, holotype m.; B, paratype f.

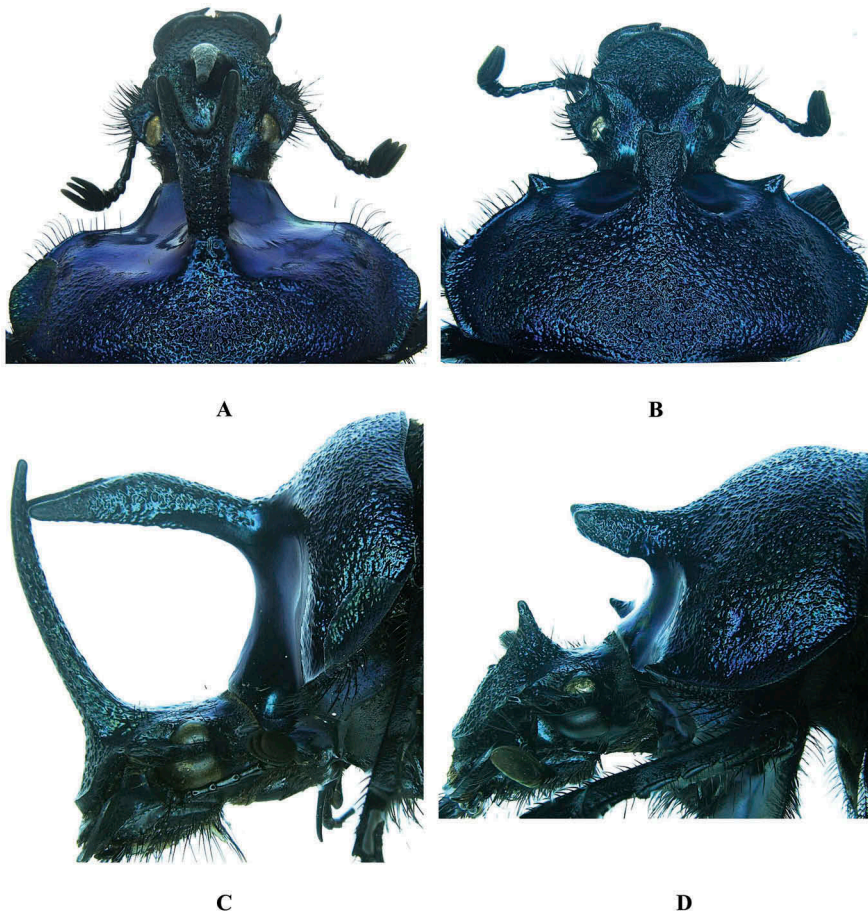


Figure 2. A-D. Pronotum and head of *Enoplotrupes (E.) tawangensis* sp. nov. m., holotype: A, dorsal view (holotype, m.); B, dorsal view (paratype, f.); C, lateral view (holotype, m.); D, lateral view (holotype, f.).

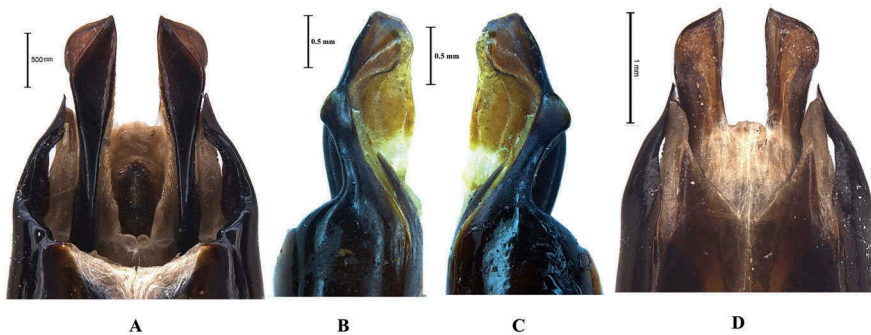


Figure 3. A-D. Parameres of *Enoplotrupes (E.) tawangensis* sp. nov. (holotype, m.): A, dorsal view; B, lateral view right side; C, lateral view left side; D, ventral view.

Table 1. Differential characters of *Enoplotrupes (E.) tawangensis* sp. nov. and *Enoplotrupes (E.) rhinoceros*.

Species/Characters	<i>Enoplotrupes (E.) rhinoceros</i> Král et al. (2012)	<i>Enoplotrupes (E.) tawangensis</i> sp. nov.
Males		
Head	Fronto-clypeal horn relatively short, not extending furca of pronotal horn apically (see Král et al. 2012, Fig. 1A). Mandibles without any tooth or sinuations externally (see Král et al. 2012, Fig. 1A).	Fronto-clypeal horn relatively long, extending beyond furca of pronotum horn apically (Fig. 2C). Mandibles with a minute tooth apically externally (Fig. 2A).
Pronotum	Lateral margins broadly rounded (see Král et al. 2012, Fig. 1A). Smooth area laterally of horn considerably flat (see Král et al. 2012, Fig. 1A). Longitudinal connection between pronotum and horn without a bridge (see Král et al. 2012, Fig. 1A). Pronotal horn moderately bifid, only slightly divergent apicad (see Král et al. 2012, Fig. 1A).	Lateral margins angulate (Figs. 2A, C). Smooth area laterally of horn bearing concavity (Fig. 2A). Longitudinal connection between pronotum and horn with a bridge (Figs. 2A, 2C). Pronotal horn strongly bifid, strongly divergent apicad (Fig. 2A).
Parameres	As in Král et al. 2012, Figs. 3A-C.	As in Figs. 3A-D.
	Females	
Pronotum	Pronotal horn of females longer in comparison to pronotal horns of males (see Král et al. 2012, Fig. 1B).	Pronotal horn of females smaller in comparison to pronotal horns of males (Figs. 2B, 2D).

Morphological terminology used in the description of adults mainly follows Zunino (1984), Král et al. (2012, 2015a, 2015b), and Ochi et al. (2017).

The following abbreviations identify the collections housing the material examined (curators are given in parentheses).

BMNH – Natural History Museum (former British Museum), London, United Kingdom (Maxwell V. L. Barclay);

JBCO – Jaroslav Bačovský collection, Olomouc, Czech Republic;

NMPC – National Museum, Praha, Czech Republic (Jiří Hájek);

ZSCI – Zoological Survey of India, Kolkata, India.

Taxonomy

***Enoplotrupes (Enoplotrupes) tawangensis* Gupta, Chandra & Král, sp. nov. (Figs 1-4)**

Type locality

India, Arunachal Pradesh, district Tawang, Lumla, 27.53722N 91.71964E, 2427 m.

Type material examined (11 specimens)

INDIA, Arunachal Pradesh. Holotype, m (ZSCI): India, Arunachal Pradesh, district Tawang, Lumla, 27.53722 N, 91.71964 E, altitude 2,427 meters, 15.



Figure 4. A-B. A, map of India and Bhutan showing Arunachal Pradesh state; B, map of Arunachal Pradesh and Bhutan showing type locality and the known distribution of the species.

ix.2016, collected, J. Saini. **Paratypes (5 m, 5 f):** 1 female (ZSCI): India, Arunachal Pradesh, District Tawang, Lumla, 27.53722 N, 91.71964 E, altitude 2,427 meters, 15.ix.2016, collected, J. Saini; 1 male (ZSCI: India, Arunachal Pradesh, district Tawang, Thrillum, 03.x.2009, collected, K. Chandra; 1 male, 2 females (ZSCI): India, Arunachal Pradesh, district Tawang, Zemmithang, 10. x.2009, collected, K. Chandra; **BHUTAN.** 1 male (NMPC): Bhutan, 17.-26.

VI.1988, Paro Distr., Gedu, 2100 m, leg. Carolus Holzschuh; 1 male (BMNH): N. India: Bhutan, Lingtse [= nowadays Lhuntse], 8000 ft., 24.VII.1933, F. Ludlow & G. Sheriff, B.M. 1933–634; 1 male, 2 females (JBCO): Bhutan, Trashigang, 5.2018, ca 27°37'N 91°30'E, ca 2100 m, J. Bačovský lgt.

Diagnosis

The newly described species is classified into nominotypical subgenus by having a pronotal horn in males slender, bifid or furcate apically, pronotum with transverse carina or furcate horn in females, and microstriolate elytra. *E. (E.) tawangensis* sp. nov. is probably closely related to *E. (E.) rhinoceros* described from Myanmar (Kachin) and India (Arunachal Pradesh: Along, Rapum) by having furcate pronotal horns in females. *Enoplotrupes (E.) tawangensis* sp. nov. can be distinguished from *E. (E.) rhinoceros* by the unique structure of parameres and fronto-clypeal horn relatively long, extending beyond furca of pronotal horn apically in males, pronotal horn strongly bifid, and divergent apicad in males, whereas in females pronotal horn relatively comparatively smaller as in *E. (E.) rhinoceros*. See [Table 1](#) for detailed differential characters separating *E. (E.) tawangensis* sp. nov. from *E. (E.) rhinoceros*.

Description (holotype, male)

Body: Broadly oval, strongly convex. Colour: Dorsal surface shining dark blue with slight greenish tinge; labrum, antennae, clypeo-frontal and pronotal horn, extremities including mandibles and venter blackish; legs shining dark blue ventrally; eyes light yellowish; macrosetation of head appendages, antennae and other parts of body black.

Head ([Fig. 2A](#)): Labrum semicircular, bilobed, anterior margin shallowly but distinctly emarginate, finely, broadly, irregularly serrate. Mandibles simply regularly accurate externally with a minutely toothed apically. Clypeus ogival, coarsely rugous, rugosities confluent, simple punctures missing; clypeo-frontal horn long, extending furca of pronotum horn apically, moderately curved backwards to almost acuminate apex, considerably rugose (as in clypeus) anteriorly, and with irregular more or less longitudinal streaks posteriorly, apex smooth; genal sutures distinct, straight and divergent posteriad, excepting parallel anterior points extending distinctly outline of head; anterolateral angles of genae considerably pointed, points directed anterolaterad, genal surface very sparsely, irregularly, longitudinally wrinkled, without punctures mainly along genal suture; occiput glabrous; vertex with few punctures.

Pronotum ([Fig. 2A, C](#)): Irregular hexagon in shape, anterior angles absent, lateral margin angulate; smooth area laterally of horn glabrous with slight concavity; pronotum and horn connected with a small longitudinal bridge,

dorsal sculpture considerably coarsely, irregularly rugose to vermiculate, somewhat confluent. Horn strongly bifid, distinctly divergent apicad, with distinctly rugose dorsal side, rugosities transversally confluent, ventral side smooth with two converging carinae.

Scutellar plate (Fig. 1A): broadly triangulate in outline, broadly sinuate anteriorly, sides broadly rounded, surface impunctate, coarsely rugose.

Elytra (Fig. 1A): Convex, with distinct impunctate humeral umbone, finely microsculptured, irregularly shaped microsculptured areas divided by fine, smooth, narrow, irregularly shaped furrows, confluent often in longitudinal rows resembling rather elytron striae.

Macropterous.

Legs: Femora unarmed, glabrous, impunctate, with two macrosetaceous transversal carinae. Prototibiae with six external teeth regularly diminishing basad; ventromedial edge unarmed, with 3–4 small teeth like projections at posterior region; meso- and metatibiae with three transversal external carinae, each with 3–4 long, robust macrosetae; exterior terminal calcar of mesotibia as long as mesotarsomeres 1–3 combined, inferior terminal calcar shorter than mesotarsomeres 1–2 combined; both terminal calcars of metatibiae equal in length and distinctly shorter than metatarsomeres 1–2 combined.

Aedeagus: Parameres of characteristic shape as in Fig. 3A–D.

Measurements: Total body length of male holotype (excluding mandibles): 27.0 mm.

Variability in males

Fronto-clypeal horn in less developed specimens short, more or less straight; horn of pronotum less developed, with only weak furca. Total body length 21.0–26.0 mm.

Sexual dimorphism

Females differ from males in following characters: total body length of females: 19.0–20.0 mm, clypeo-frontal and pronotal horns shorter, pronotal horn parallel-sided, furcate apically, and anterior angles of acuminate and angulate (Figs 1B, 2B, D).

Collecting circumstances

Material from Arunachal Pradesh was handpicked from dung.

Distribution

So far known only from India (Arunachal Pradesh) and Bhutan (Fig. 4A–B).

Etymology

The specific name *tawangensis* refers to the Tawang district of Arunachal Pradesh state, India.

Identification key to the species of genus *Enoplotrupes* from India

1. Pronotal horn in male slender, bifid or furcate apically, in female pronotum with transversal carina or furcate horn; elytra chagrined, microstriolate, as a rule, alutaceous or moderately shiny; colour of dorsum blackish, bluish, dark blue, often with weak brownish, greenish, cuprous or violet tinge..... **sbg. *Enoplotrupes* P. H. Lucas, 1869**..... 2
 - Pronotal horn in male short, obtuse, rounded apically in female pronotum with transversal carina; elytra multistriate, as a rule moderately shiny; colour of dorsum black, often with weak bluish brownish tinge.....
..... **sbg. *Gynoplotrupes* P. Obertür, 1883**.....
..... ***Enoplotrupes* (G.) *bieti bieti* Obertür, 1883**
2. Dorsal surface distinctly multistriate. Pronotum with small transverse carina, without teeth in females.....
..... ***Enoplotrupes* (E.) *splendens* Rothschild and Jordan 1893**
 - Dorsal surface only slightly multistriate. Pronotum without carina but with a long and furcate horn in females 3
3. Pronotal horn moderately bifid, only slightly divergent apicad in males; in females, pronotal horn longer in comparison of males; in males, fronto-clypeal horn relatively short, not extending furca of pronotal horn apically and longitudinal connection between pronotum and horn without bridge.....
..... ***Enoplotrupes* (E.) *rhinoceros* Král et al. 2012**
 - Pronotal horn strongly bifid, divergent apicad in males; in females, pronotal horn shorter in comparison of males; in males, fronto-clypeal horn relatively long, extending beyond furca of pronotal horn apically and longitudinal connection between pronotum and horn with bridge.....
..... ***Enoplotrupes* (E.) *tawangensis* Gupta, Chandra & Král sp. nov.**

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Disclosure statement

No potential conflict of interest was reported by the authors.

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