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## A new flanged bombardier beetle from the Indomalayan Region (Carabidae, Paussinae, Paussini)

by Peter Nagel & Michal Bednařík

**Abstract.** Recent entomological surveys in Laos have revealed new species of myrmecophilous flanged bombardier beetles. Here we describe and illustrate *Paussus serraticornis* sp.nov., a paussine characterized mainly by its distinctive antennal club. It shares characters with members of the *Paussus hystrix* and *P. cucullatus* groups.

**Key words.** Carabidae - Indomalayan Region- Laos - new species - Paussini - *Paussus* – Vietnam

### Introduction

The Old-World tropics harbour the highest number of species of the myrmecophilous Paussini. Located in the Old-World tropics, Laos lies at the centre of the Indochinese zoogeographical sub-region of the Indomalayan region (*cf.* CORBET & HILL 1992), and is of interest for the Paussini both taxonomically and biogeographically. However, the Laos fauna is not as well known as that of the surrounding areas and the discovery of species new to science and species already reported from surrounding regions are to be expected (*cf.* FATTORINI *et al.* 2012). The first account of the paussine fauna of Laos listed nine species, of which two were new to science (NAGEL 2009). Further contributions on the flanged bombardier beetles of South-eastern Asia were published by MARUYAMA (2011) and MARUYAMA *et al.* (2012). Here, we describe another new member of the species-rich genus *Paussus* Linnaeus *s.l.*

### Material and Methods

All specimens are dry-mounted and glued to pinned cards. They are deposited in the collections listed below, together with their abbreviations. The dissected aedeagi are mounted on pinned cards and accompany the relevant specimens.

The material was examined with a Leica M205C stereomicroscope at magnifications of up to 100×.

**Measurements:** The body length is measured from the tip of the clypeus to the apex of the elytra. If the specimen was markedly bent, the parts were measured separately and the measurements added together. The width of the elytra is measured at midway along their length, taking both elytra together.

The tip of the male abdomen was removed, briefly boiled in 10% KOH, rinsed in low concentration acetic acid and the male genitalia were dissected, examined and photographed in glycerol. The photographs were taken with a camera mounted on an Olympus SZX-16 dissecting microscope.

The drawing shows the specimen with the appendages of the right side in their broadest view, while the left antenna and legs are shown twisted through 90 degrees, i.e. at their narrowest view (*cf.* Nagel 2006). The combination of this type of drawing and the photographs facilitates a realistic three-dimensional visualisation of the species.

The classification follows NAGEL (2003) and GEISELHARDT *et al.* (2007).

#### Abbreviations

BGUB	... Coll. P. Nagel in Biogeographische Sammlung, Universität Basel, Switzerland
MBCO	..... M. Bednařík collection, Olomouc, Czech Republic
MNHN	..... Muséum National d'Histoire Naturelle, Paris, France
SJCP	..... S. Jakl collection, Praha, Czech Republic

### Taxonomy

#### PAUSSINI LATREILLE, 1806

#### Paussina Latreille, 1806

#### *Paussus serraticornis* sp.nov.

(Figs 1–5)

**Type material.** Holotype, female (BGUB): NE-Laos, Hua Phan prov, Ban Saleui, Phou Pan (mt.), ~20°12'N 104°01'E, 22.V.2011, 1300–1900 m, leg. C.Holzschuh [white label, black printing]; 9. [handwritten]; ♀ [black printing]; HOLOTYPE, *Paussus serraticornis* Nagel et Bednařík, 2013 [red label, black printing]. Paratypes: Male (MNHN), [northern Vietnam] Tonkin occ., Rég. de Hoa Binh, R.P. A. de Cooman, 1919 [white label, black printing]; PARATYPE, *Paussus serraticornis* Nagel et Bednařík, 2013 [red label, black printing]. Male (MBCO): aedeagus glued to a second card, pinned with specimen; LAOS-N (Louangphrabang), 11-21.v.2002, 19°35'N 101°58'E, THONG KHAN, ~50 m, Vit Kubáň leg. [white label, black printing]; PARATYPE, *Paussus serraticornis* Nagel et Bednařík, 2013 [red label, black printing]. Female (SJCP): NE LAOS, Hua Phan Prov., MT PHU PANE, 1200–1600m, 10–22.V.2011, 20°12'N 103°59'E, St Jakl and Lao collectors lgt [white label, black printing]; ♀ [black printing]; PARATYPE, *Paussus serraticornis* Nagel et Bednařík, 2013 [red label, black printing].

**Description.** Holotype, female, BGUB: body length 4.8 mm (clypeus to apex of elytra), width at midway, both elytra, 1.9 mm; Paratype, male, MNHN: body length 4.8 mm, elytral width 1.9 mm; Paratype, male, MBCO: body length 5.0, elytral width 2.0 mm; Paratype, female, SJCP: body length 5.0 mm; elytral width 2.1 mm.

**Body** brown to light brown with smaller parts of thoracic sterna and abdomen dark brown; slightly lustrous, despite rough surface sculpturing; all body parts distinctly pilose; pubescence of long, thin, spreading hair, intermixed with a few longer, slightly thicker and equally straight setae; abdominal pubescence mostly adpressed.

**Head** subglobular, with vertex high and dorsal parts strongly inclined; clypeus with frontal margin bluntly edged, not indented, slightly depressed at centre and set with a short, dark, longitudinal line; distinct depression at vertex, bordered at each side by a raised, shell-like, double-walled costa; these double-walled costae are separated at their tops by a narrow groove; these costae slightly higher and more strongly demarcated by slight depression above eyes in the male specimen; a small and inconspicuous gland opening might be present at the upper inner part of the shell-like costae; eyes reniform, quite small and a little less prominent in the female and large and more prominent in the



male; temples narrow, not projecting laterally beyond eyes; surface coarsely set with rounded granules, except central depression and costae with fine microsculpture.

**Mouth-parts** of same ground-plan as shown for the *Paussus jousselinii* group (Nagel in prep., cf. RAFFRAY 1886a, t.17, f.3) with transverse, rectangular labrum; 2nd maxillary palpomere large and broad, 1.3 times longer than wide; subapical and apical maxillary palpomeres together shorter than 2nd, apical palpomere tapering towards apex and little longer than preceding one; apical labial palpomere longitudinal, narrow, tapering towards pointed apex and about two times longer than 1st and 2nd labial palpomeres together; ligula large, thick, broad, cushion-shaped, largely obscured by palpi.

**Antenna** with 1st antennomere (= scape) longitudinal, subcylindrical with apical third asymmetrically dilated to support the ball-and-socket joint of the antennal club; scape lustrous with scattered setae arising from small granules; 2nd antennomere of normal vestigial ring-like structure; antennal club (fused antennomeres 3 to 11) longitudinal, narrow, 4.4 times as long as wide; apically and basally of almost equal width (male) or apically distinctly wider than basally (female); dorsal and ventral surface each with a longitudinal furrow, ending shortly before apex; interior (= anterior) side broadly and weakly undulate, slightly marginate and finely carinate, especially along apical quarter; apex broadly rounded, almost subtruncate; exterior (=posterior) side of club longitudinally channelled; dorsal margin of exterior side set with five robust tubercles, finely channelled ventrally; ventral margin of exterior side with four well-demarcated, broad, blunt teeth in females and these four plus a basal, less distinct tooth in males (apical and basal corners of the club not considered for this count); inner basal corner of club not pronounced, obtuse; outer basal corner pronounced, forming a slightly acute yet blunt angle (male) or a wide and rounded angle (female); interior marginal band of dorsal surface with rugose punctation in males and without punctation yet slight rugosity in females, apical part densely microsculptured in both sexes (apical sensory field, NAGEL 1980); basal margin between insertion and outer basal corner entire, without incision or indentation yet small window of thinly sclerotized, semitransparent cuticle present.

**Pronotum** small, bipartite, dorsally with transverse, deep furrow and distinct lateral constriction; anterior and posterior part of equal width; 1.2 times wider than long, in male and female narrower than head; only vestiges present of dorso-lateral trichomes and associated gland openings; surface structure rugose yet lustrous.

**Elytra** 1.5 to 1.7 times longer than broad; humeri well demarcated; surface structure rugose, without punctation, weakly lustrous; setae of the series umbilicata indistinguishable from setae of the general pubescence; hind wings present.

**Pygidium** with disc excavated, sparse pubescence shorter and less distinct than on elytra, except two large tufts of long, loosely-set hair on the disc at both sides of the apical margin; ventral part of apical margin with a band of long, loosely set setae.

**Stridulatory organ** present, of normal *Paussus s.l.* shape at inner base of metafemur and proximal abdominal ventrite.

**Legs** long and slender; protibia straight, mesotibia almost straight, basal half of metatibia slightly curved inwardly, especially in the male; surface of legs almost smooth,

lustrous; hind margin of all tarsomeres entire, dorsally straight or inconspicuously emarginate; terminal tibial spurs absent; all tibiae with distal ventral part with denser pubescence; tarsomeres 1–4 without adhesive pads but with groups of stiff bristles in both sexes.

**Female genitalia:** projecting gonostyli of normal *Paussus s.l.* shape (cf. DARLINGTON 1950a, p.140, figs 201–206).

**Aedeagus** of the dissected paratype (MBCO) slightly damaged yet complete; ground-plan of middle lobe similar to other Indochinese *Paussus s.l.* (DARLINGTON 1950a, p.139, figs. 177–184); middle lobe elongate, slender, slightly arcuate; ventral process (for articulation of parameres) strongly developed; apex with step-like emargination dorsal to the blunt, stout apical process; subapical orifice with oval, squamiform, sclerotized cover which is pushed aside by the eversible sac when operational; parameres slender, apical parts narrow with apex rounded and devoid of setae.

**Sexual dimorphism** weakly developed, see description above: shape of eyes, shape of shell-like structures at vertex, shape and microstructure of antennal club, including different numbers of teeth, curvature of hind tibia.

**Etymology.** The specific epithet is composed of the Latin adjective *serratus*, meaning serrate or serratiform, and the Latin noun *cornu*, meaning horn or antenna. This refers to the shape of the antennal club, the hind margin of which is set with upper and lower rows of large, blunt tubercles and teeth. It is reminiscent of a saw blade set with coarse teeth.

**Host ant.** Unknown.

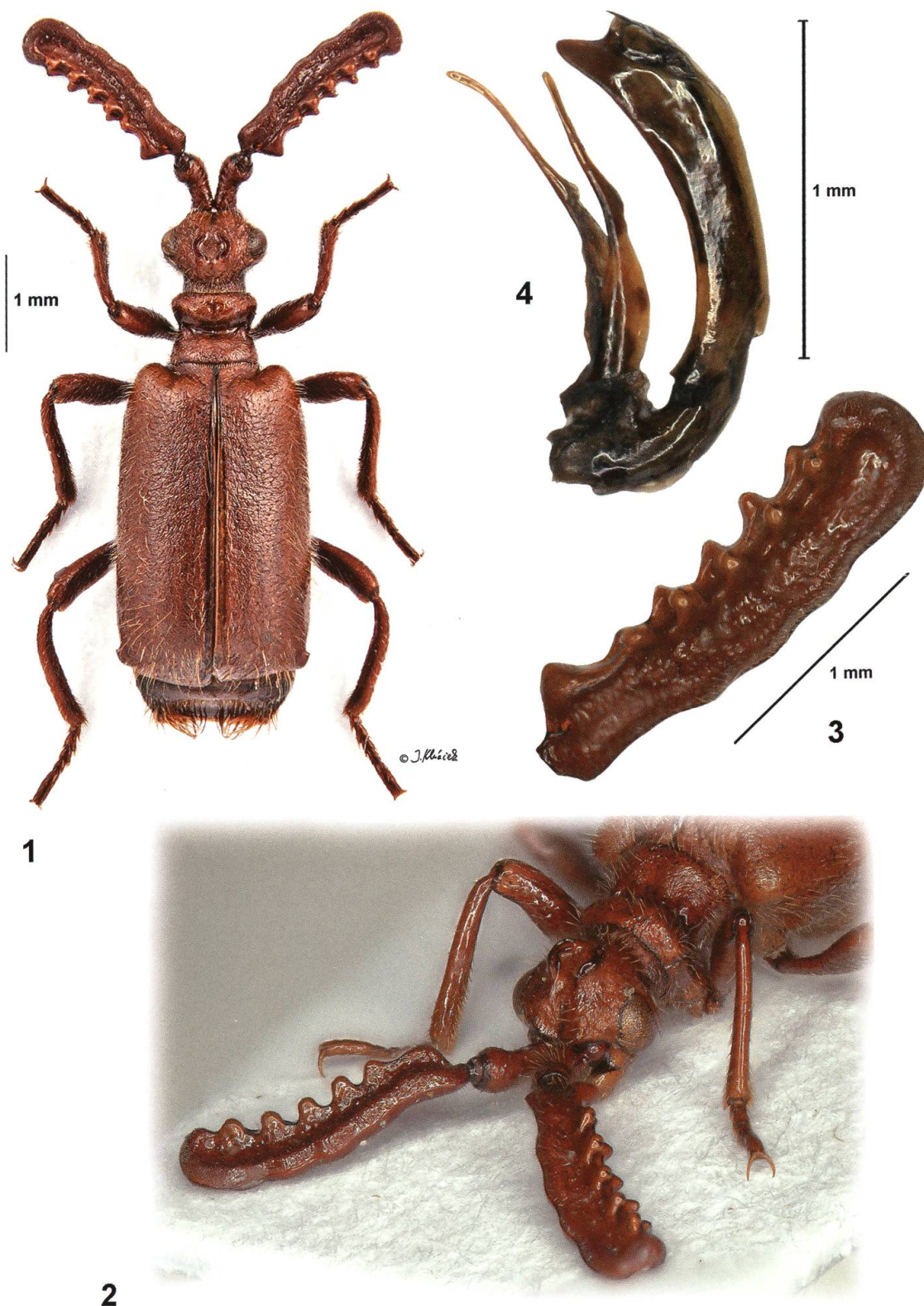
**Habitat.** Type locality Phou Pane: The sampling area of the holotype specimen near Phou Pane Mountain, north-eastern Laos, is characterized by tropical montane deciduous forest and secondary open grassland (mostly pasture with scattered broad-leaved scrub), and comprises an altitudinal range of 1200m to less than 1600m (not 1900m as written on the label, C. Holzschuh pers. comm.). Paussine specimens were collected in a larger area by C. Holzschuh and local collectors, mostly during the day on house walls which were illuminated during the night (if specimens had been sampled together with ants they would have been labelled as such).

The specimen from Thong Khan, Luang Phrabang province, was collected at an altitude of 750m by a flight interception trap set on the grounds of the National Agriculture and Forestry Research Institute. The collection habitat was most probably the lower parts of a montane forest which, in 2002, was certainly still more extended and less degraded than when Michal Bednařík (2009) and Peter Nagel (2010) visited the area.

All specimens from Laos were collected during the second half of May, which coincides with the beginning of the rainy season (south-west monsoon).

**Differential diagnosis.** *P. serraticornis* sp.nov. belongs to the large group of *Paussus s.l.* with transversely deeply bipartite pronotum, and this species is unmistakably characterized by the combination of the following characters: body brown, strongly pilose; vertex distinctly depressed; this central depression laterally bordered by double-walled, erect, shell-like structures; first antennomeres longitudinal; antennal club





**Figs 1–4.** *Paussus serraticornis* sp.nov.: paratype, male. Laos: Thong Khan. 1 – dorsal view. 2 – oblique frontal view. 3 – dorsal view of left antenna. 4 – male copulatory organ (aedeagus): middle lobe and parameres.

longitudinal, narrow, with upper and lower posterior margins each set with five robust tubercles and blunt teeth respectively; legs long, slender; pygidium at both sides of outer margin with loose tuft of long setae. Body length 4.8–5.0 mm.

**Remarks on classification.** The new species does not fit easily into any of LUNA DE CARVALHO's (1989) genera or subgenera of *Paussus s.l.* or any of the established species groups. It shares with the *Paussus hystrix* group (*Scaphipaussus* Fowler *sensu* Luna de Carvalho) the ground plan of the vertex ornamentation and the antennal club. It differs in the pronotum with its vestigial trichomes, in its long, narrow legs, and slightly, yet not fundamentally, in the shape of the labial and maxillary palpi. Shell-shaped protection structures at the vertex also exist in the *Paussus cucullatus*-group (part of *Cochliopausus* Kolbe) (cf. NAGEL 2006); however, in similarity to the *Paussus hystrix*-group, the mouth-parts are slightly different and the pronotum is clearly different. The distinctive longitudinal first antennomere is generally present only in some Malagasy taxa (cf. JEANNEL 1946). A few other examples include the Afrotropical *Paussus darlingtoni* Reichensperger and the Indochinese *Paussus atheruri* Luna de Carvalho, both classified as *Cochliopausus* Kolbe by LUNA DE CARVALHO (1989). They differ from our new species in, among other things, the head ornamentation, shape of clypeus, shape of antennal club and type of pubescence. *P. atheruri* has been reported from southern Vietnam, and, in addition to the zoogeographical region it shares with *P. serraticornis* sp.nov. a certain structural similarity (elongate first antennomere, long legs, narrow pronotum, pronotum with reduced trichomes) which might be indicative of a close relationship.

**Distribution.** The specimens of the type series were sampled at one locality in northern Vietnam and two localities in northern Laos. In Laos, two specimens were found near the village of Ban Saleui and the adjacent Mount Phou Pane, Hua Phan prov. One specimen was collected near Thong Khan, Luang Phrabang province.

### Acknowledgements

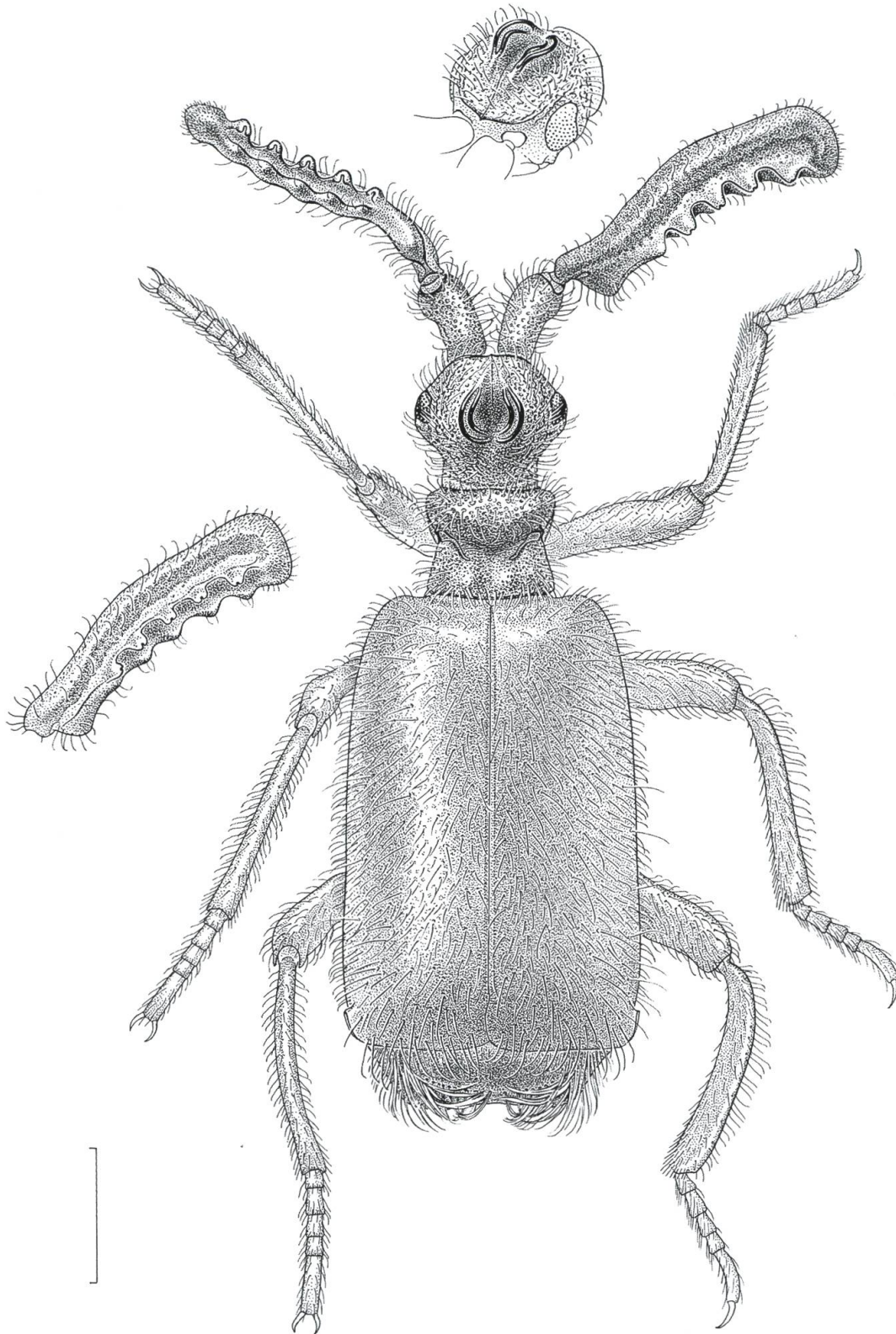
We are grateful to Ms. Eva Weber, Basel, for her precise black ink drawings and Mr. J. Klváček, Přerov, Czech Republic for photographs of the specimen.

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**Fig. 5.** *Paussus serraticornis* sp.nov.: holotype, female. Laos: Phou Pan Mt.; appendages of the right side shown in their broadest possible view while the left antenna and legs are shown twisted through 90 degrees, i.e. they are shown in their narrowest view; separately-drawn right antennal club in dorsal view, slightly distorted along longitudinal axis for better view of posterior tubercles and teeth; separately drawn head in oblique fronto-dorsal view.



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