

***Paussus brancuccii* sp.nov., an unusually abundant species of
the *Paussus jousselinii* group from Laos and South China
(Coleoptera, Carabidae, Paussinae, Paussini)**

by Peter Nagel

Abstract. A new myrmecophilous species of flanged bombardier beetles is described from northeastern Laos and China (Guangxi), *Paussus brancuccii* sp.nov. This species stands out from other members of the *Paussus jousselinii* group and most other Paussines by the large number of specimens available for study from one single locality. The long series allows an assessment of the variability of the shape of the antennal club. Some specimens were collected together with the possible host ants *Tetramorium* sp. and *Pheidole* sp. (Myrmicinae).

Key words. Paussini – *Paussus* – new species – host ants – montane deciduous forest – Laos – China

Introduction

Among the predatory Flanged bombardier beetles (MOORE 2006) or False bombardier beetles (ERWIN *et al.* 2015) (Carabidae, Paussinae) at least Protopaussini and Paussini are obligatory myrmecophiles which parasitize in ants nests (Ant nest beetles, see review by GEISELHARDT *et al.* 2007). They inhabit the tropics and adjacent regions with highest species diversity in the Afrotropical and Indomalayan zoogeographical regions. The most recent contributions to the Paussine fauna of Laos comprise NAGEL & BEDNÁŘÍK (2013) and MARUYAMA (2014).

The parasitic life style of Paussines in ant nests is one of the main reasons for their rarity in most collections. Few species only are represented by longer series of specimens, mostly collected just once or in subsequent years at one locality. On the basis of such rare occasions we are able to describe and analyse the within-population variability of morphological traits.

Paussine specimens brought together during the Laos project of the late Michel Brancucci are available for the revisionary work of the *Paussus jousselinii* group which revealed several new species (Nagel in prep.). In addition, types and other specimens are available from scientific institutions part of which was visited by me in person. Several colleagues provided abundant material. The present paper is an independent, partial pre-publication of the revision of the *Paussus jousselinii* group, focussing on one new species. This species proved to be outstanding and distinctive within this group with regard to the unique formation of the basis of the antennal club and its high abundance, for example.

The paper serves to introduce this new species to science. *Paussus brancuccii* sp.nov. is a further reverence to our deceased friend and colleague Michel Brancucci. It is presented in this second volume of *Entomologica Basiliensia et Collectionis Frey* which is dedicated to his initiative and work for the project on the “Beetle Diversity of Laos”.

Material and Methods

The material was examined with a stereomicroscope Leica M205C, with eyepieces 10× and front lenses Planapo 1.0× and 1.6×, allowing magnification up to approximately 250 times.

All but one specimens are dry-mounted, mostly glued to pinned cards, sometimes fixed by micro-pin to a pinned synthetic “Polyporus”-support. One specimen is preserved in 100% alcohol.

The dissection of the aedeagi comprised their removal from the abdomen, treatment with hot KOH solution and clearance from attached tissue. The drawing was initially made of fresh material of one aedeagus. Afterwards they were mounted on cards and pinned with the beetle. A detail drawing of the same, yet dried material was added (Fig. 8).

The drawing of the whole specimen (Fig. 2) shows 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.

In the taxonomy chapter, list of examined material, the verbatim label data are given. Text in square brackets are additions of the present author.

The material of the present study is deposited in the following public and private collections:

Coll. Bednařík	.....	M. Bednařík, Olomouc, Czech Republic
BGUB	.....	Coll. P. Nagel in Biogeographische Sammlung, Universität Basel, Switzerland
Coll. Brunk	.....	I. Brunk, Technische Universität Dresden, Germany
Coll. Maruyama	.....	M. Maruyama, The Kyushu University Museum, Fukuoka, Japan
NHMB	.....	Naturhistorisches Museum Basel, Switzerland
NMP	.....	National Museum Prague, Czech Republic (received <i>via</i> M. Bednařík)
Coll. Wrase	.....	D. W. Wrase, Berlin, Germany

Taxonomy

Paussus brancuccii sp.nov. forms part of the Indomalayan *Paussus jousseleinii* group. This species group has been treated as one part of *Paussus* subgenus *Shuckardipaussus* Kolbe, 1938 by LORENZ (2005) which previously had been regarded as a part of the genus *Curtisipaussus* Luna de Carvalho, 1989 by LUNA DE CARVALHO (1989) (*Curtisipaussus* Kolbe, 1938, is not valid, see BOUSQUET 2002, NAGEL 2003). Most of the genera or subgenera of LUNA DE CARVALHO (1989) or LORENZ (2005) under *Paussus* L. *sensu lato* form part of para- or polyphyletic assemblages because of unresolved phylogenetic relationships. Most of the morphological character states used till date for the classification at the genus group level might actually be the result of convergent evolution, making their traditional use for the reconstruction of phylogenies questionable (MOORE & ROBERTSON 2014). We therefore refrain from using subgenera of *Paussus* L. as valid names in order to avoid further nomenclatural confusion until phylogenetically based analyses will have been elaborated (NAGEL 2003).

According to the current state of the revisionary work, the *P. jousseleinii* group comprises some 20+ Indomalayan species, 12 of which still undescribed. One of the latter is described in the following.

PAUSSINI LATREILLE, 1806

Paussina Latreille, 1806

Paussus Linné, 1775

Paussus brancuccii sp.nov.

(Figs 1–8)

Type locality. NE-Lao PDR, Houaphanh prov., Xamneua (Sam Neua) district, at the foot of Phu pane (Phou Pane, Phu Phan) mountain, short distance beneath the village of Ban Saleui (Ban Saleuy), slightly lower than 1300m a.s.l., on a dry, grazed, gentle slope covered with abundant grass and scattered broad-leaved bushes, 20°12'N 104°01'E. This locality refers to the holotype specimen and the female paratype with ants (C. Holzschuh, pers. comm. 2012).

Type material. Holotype, ♂ (NHMB), LAOS: NE Laos, Hua Phan prov., Ban Saleui, Phou Pan (Mt.), 20°12'N 104°01'E, 11.v.2011, 1300–1900m, leg. C. Holzschuh [in person, pers. communication 2012] / 2 [small rectangular orange-red label to indicate presence of ants; n° 2 = internal numbering of beetle species by collector] / *Tetramorium* sp., P. Nagel det. 2015 / HOLOTYPE, *Paussus brancuccii* Nagel [red label] [2 worker ants glued to separate card at the same pin] [Condition of holotype specimen: good, tarsomeres 3 to 5 of right mesotarsus absent, aedeagus not dissected; the holotype specimen was selected because it is the only male specimen with ants attached].

Paratypes, 437 ex. in total, LAOS: 1♀ (BGUB): NE Laos, Hua Phan prov., Ban Saleui, Phou Pan (Mt.), 20°12'N 104°01'E, 24.v.2011, 1300–1900m, leg. C. Holzschuh/ 2 [small rectangular red label to link with separately pinned ants; n° 2 = internal numbering of beetle species by collector] / ♀ / [with 1 worker of *Tetramorium* sp., det. P. Nagel, and 1 indet. winged adult glued to card and pinned with beetle] [4 separately pinned cards with ants with same labels as beetle: 3 *Tetramorium* sp. workers + 1 *Pheidole* sp. minor worker, 5 *Tetramorium* sp. worker ants, 4 *Pheidole*? sp. winged ants, 3 *Tetramorium* sp. workers + 1 *Pheidole* sp. minor worker + 2 indet. winged ants; all ants det. Mezger & Brühl, 2013]; 1 ex. (BGUB): NE Laos, Hua Phan prov., Ban Saleui, Phou Pan (Mt.), 20°12'N 104°01'E, 1.–15.v.2010, 1300–1900m, leg. C. Holzschuh; 1 ex. (Coll. Bednařík): NE-Laos, Hua Phan prov., Ban Saleui, Phou Pan (Mt.), 20°12'N 104°01'E, 9.V.2011, 1300–1900m, leg. C. Holzschuh; 2♂, 1♀, 17 ex. (BGUB): NE Laos, Hua Phan prov., Ban Saleui, Phou Pan (Mt.), 20°12'N 104°01'E, 11.v.2011, 1300–1900m, leg. C. Holzschuh; 21 ex. (NHMB): NE Laos, Hua Phan prov., Ban Saleui, Phou Pan (Mt.), 20°12'N 104°01'E, 11.v.2011, 1300–1900m, leg. C. Holzschuh; 1 ex. (BGUB): NE Laos, Hua Phan prov., Ban Saleui, Phou Pan (Mt.), 20°12'N 104°01'E, 11.v.2011, 1300–1900m, leg. C. Holzschuh [preserved in small vial in absolute alcohol]; 2 ex. (BGUB): NE Laos, Hua Phan prov., Ban Saleui, Phou Pan (Mt.), 20°12'N 104°01'E, 12.v.2011, 1300–1900m, leg. C. Holzschuh; 6♂, 6♀, 4 ex. (Coll. Bednařík): Laos-NE, Houaphan prov., Phou Pane Mt., Ban Saleui env., 10.–22.V.2011 / 20°12'N 103°59'E, 1200–1600m, St. Jákl and Lao collectors leg. [lot identified as: *Paussus (Curtisipaussus) n.sp.*, M. Bednařík det. 2012]; 30♂, 27♀, 34 ex. (NMP): Laos-NE, Houa Phan prov., 20°13'30"N 103°59'30"E, Ban Saleuy village env., 15–22.vi.2011, ~1350m, Vit.Kubáň & Lao coll.leg. / Secondary mountain forest, individual collecting, Laos 2011 Expedition, National Museum Prague, Czech Republic [lot identified as: *Paussus (Curtisipaussus) n.sp.*, M. Bednařík det. 2012]; 2♂, 3ex. (NMP): Laos-NE, Houa Phan prov., 20°13'30"N 103°59'30"E, Ban Saleuy village env., 14–24.vi.2012, ~1350m, Vit. Kubáň & Lao coll. leg. / Secondary mountain forest, individual collecting, Laos 2011 Expedition, National Museum Prague, Czech Republic [lot identified as: *Paussus (Curtisipaussus) n.sp.*, M. Bednařík det. 2012]; 2♀, 7 ex. (Coll. Maruyama): NE Laos, Xam Neua (Sam Neua), Phu Pan (Phoo Pan), 1.–8.VI.2011, by FIT; 1♀ (Coll. Wrase): LAOS-N.E., Mt. Phu Phan, h=2060m NN, IV–V. 2012, ex coll. M.Tanidra; *Paussus (Curtisipaussus) jousselini* Guerin-Meneville, 1838, det. Brunk, 2013; coll. Wrase, Berlin; 19 ex. (Coll. Brunk): LAOS-N.E., Mt. Phu Phan, h = 2060 m NN, IV–V. 2012, ex coll. M. Tanidra; *Paussus (Curtisipaussus) jousselini* Guerin-Meneville, 1838, det. Brunk, 2013; 33 ex. (Coll. Brunk): NE LAOS, Mt. Phu Phan 2060m, VII.2013, legit Steeve Collard, Ankauf 2013; *Paussus (Curtisipaussus) jousselini* Guerin-Meneville, 1838, det. Dr. I. Brunk, 2013; 56 ex. (Coll. Brunk): NE LAOS, Mt. Phu Phan 2060m, VI.2013, legit Steeve Collard, Ankauf 7/2014; 46 ex. (Coll. Brunk): NE LAOS, Mt. Phu Phan 2060m, VII.2013, legit Steeve Collard, Ankauf 7/2014; 43 ex. (Coll. Brunk): NE LAOS, Mt. Phu Phan 2060m, VIII.2013, legit Steeve Collard, Ankauf 7/2014; 5 ex. (Coll. Brunk): NE LAOS, Mt. Phu Phan 2060m, VI.2014, legit Steeve Collard, Ankauf 7/2014; 2♀, 1 ex. [BGUB]: Northwest LAOS, North 2 KM Oudomsay [= Muang Xai] [ca 20°42'18"N 101°58'31"E], 21–22 June 2014, Li Jingke leg.; coll. NAGEL; CHINA: 4 ex. (BGUB): CHINA, Mt. Dawangling, Jiangxi zhen [22°46'28"N 108°05'57"E], Nanning City, Guangxi, 16–29 May 2014, Wang lifeng leg. (received via Li Jingke); coll. NAGEL.



Fig. 1. *Paussus brancuccii* sp.nov., habitus. Paratype male: Laos-NE, Houa Phan prov., 20°13'30"N 103°59'30"E, Ban Saleuy village env., 15.–22.vi.2011, 1350 m, Vit. Kubáň & Lao coll. leg.; secondary mountain forest, individual collecting. (photo M. Borer).

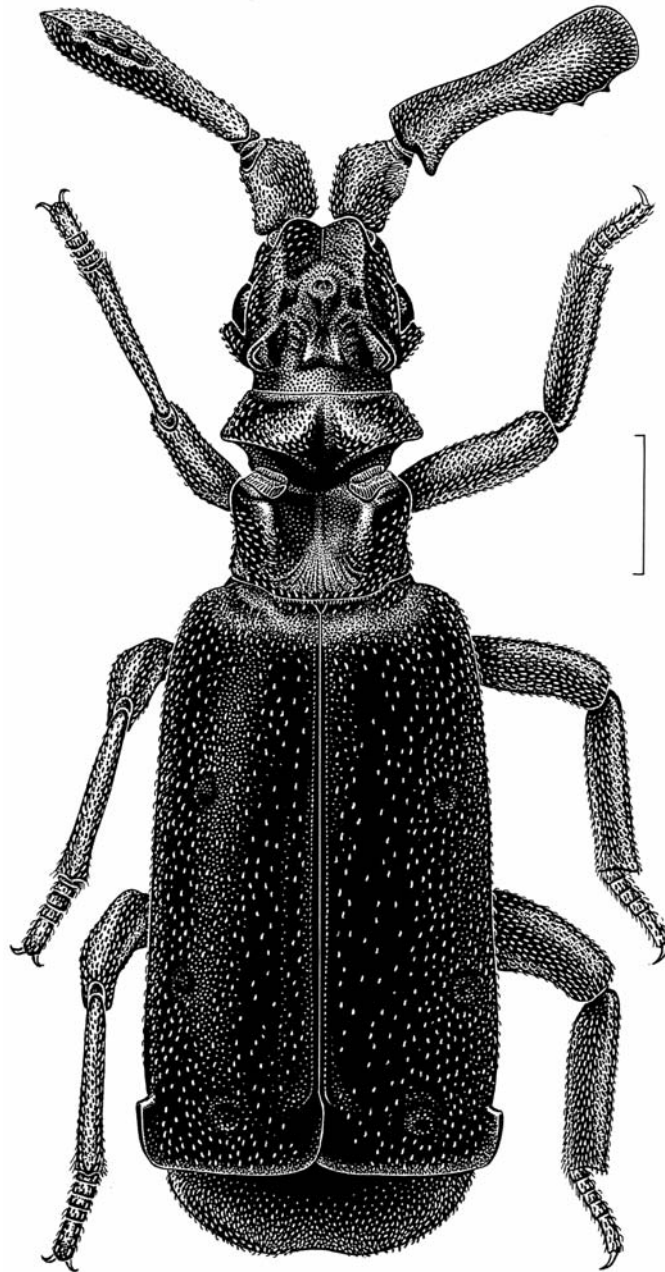


Fig. 2. *Paussus brancuccii* sp.nov., habitus. Appendages of the right side shown in their broadest view, left antenna and legs shown twisted through 90 degrees, i.e. shown in their narrowest view. Paratype male: NE Laos, Hua Phan prov., Phou Pan (Mt.), 20°12'N 104°01'E, 12.v.2011, 1300–1900m, leg. C.Holzschuh (BGUB). Scale = 1 mm (illustration E.Weber).

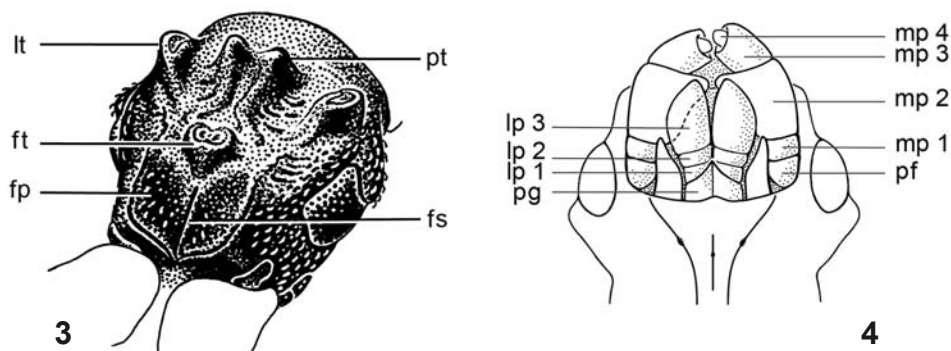


Fig. 3. *Paussus brancuccii* sp.nov., head in oblique fronto-dorsal view (fp = frontal plate; fs = frontal suture; ft = frontal tubercle; lt = lateral tubercle; pt = posterior tubercle). Paratype male: NE Laos, Hua Phan prov., Phou Pan (Mt.), 20°12'N 104°01'E, 12.v.2011, 1300–1900m, leg. C. Holzschuh (BGUB) (illustration E. Weber).

Fig. 4. *Paussus brancuccii* sp.nov., mouthparts (lp 1–3 = labial palpomeres 1 to 3; mp 1–4 = maxillary palpomeres 1 to 4; pf = palpifer; pg = palpiger). Paratype male: NE Laos, Hua Phan prov., Phou Pan (Mt.), 20°12'N 104°01'E, 12.v.2011, 1300–1900m, leg. C. Holzschuh (BGUB) (illustration E. Weber, A. Gertsch).

Description. *Standardized body length* (in dorsal view, frontal margin of head until hind margin of elytra): 5.8–6.9 mm; width across mid-elytra 2.1–2.4 mm; holotype specimen 6.8 mm, 2.3 mm

Colour (Fig. 1): A dark, dull species; head, prothorax, elytra and pygidium blackish, and antennae, mouthparts, legs, abdomen, lateral and apical elytral margin, and subapical elytral flanges dark rufous-brown.

Surface structure: Overall appearance dull due to very dense microgranulation on elytra, anterior and lateral parts of pronotum; head with prominent relief, rugose and densely set with small contiguous punctures;

Pubescence of small yellowish, obconical to obtuse lanceolate, scaliform setae regularly set one per puncture on legs and antennae, patchy and scattered on head, pronotum, elytra; setae narrower and less scaliform on pygidium and dorsal tarsi; short, thin, curved to erect setae of the *series umbilicata* in umbilical punctures difficult to see, up to three set along the proximal half of the elytral lateral margin plus one on the disk next to the subapical fold.

Head (Fig. 3) 1.3 times broader than long; surface of head very uneven, dull, with sharply marked contiguous punctures and microgranulation, at high magnification reminiscent of the tubular layer of a *Boletus*; location and shape of the four tubercles as illustrated in Fig. 3; posterior tubercle at vertex higher than the remaining ones and distinctly notched at apex; frontal suture glabrous, shining, sometimes forming a narrow groove; each of the two frontal plates in front of frontal tubercle steeply inclined towards frontal suture and little longer than wide (<1.2 times); seen from above, pair of frontal plates 1.5 times wider than long; ratio eye/gena (shortest diameter of eye between front

and hind margin / shortest distance between antennal insertion and front margin of eye): 1.3 females, 1.6 males; temples projecting beyond eyes; while small subapical orifices are visible in the slit-like structures of the two lateral tubercles, no distinct aperture is detectable in the double-pore-like structure on top of the frontal tubercle; all three tubercles, however, are actually functional as gland openings because amber-coloured residues of the exudate are sometimes visible at the respective sites.

Mouth parts (Fig. 4) adjacent to the underside of head; labrum transverse, frontal margin concave; palpifer (part of stipes) exposed; maxillary palpi with 2nd (third from last) palpomere longest and broadest, dilated towards apex, 1.1 times longer than wide at apex; palpiger (part of praementum of labium) exposed; terminal labial palpomere 1.6 times longer than wide, fusiform, tapering towards the well marked apex; shield-like ligula with frontal margin tapering to a rounded point with few setae, disk with low, longitudinal, medial carina.

Antenna (Fig. 5): First antennomere (scape) subquadrate with cushion-like brush of dense setae at dorso-lateral angle of inner apical margin (trichome); antennal club a compressed rod with base and apical half wider than the constricted "handle"; posterior outer basal angle pronounced yet not extended; 5.2 times longer than wide at narrowest part of handle, 3.4 times longer than wide at apical dilatation; basal margin without trace of incision between insertion and posterior angle, often with a smooth area without punctures instead; apical half posteriorly with a furrow which extends to about the middle of the club; lower edge of furrow with three obtuse denticles without trace of apical tuft of hair; in some specimens the denticles are very weak, sometimes also irregular with one or two denticles smaller or almost obliterated (Fig. 6); sometimes the denticles are completely obliterated and the lower margin of the furrow appears to be slightly irregularly undulate; upper edge of furrow slightly sinuose, obscuring three small, knoblike tubercles, located inside the furrow immediately below the margin; longitudinal carina at anterior margin of antennal club of males complete, yet less sharp in the middle; in females this carina is almost obliterated in middle; surface of club coarsely punctured, each puncture with one scaliform seta.

Pronotum (Fig. 2) as long as wide, as wide as head, transversally cleft; anterior part raised, distinctly edged behind, dorsally notched and laterally angulate; anterior part slightly wider than posterior part (1.1 times); hind part distally and proximally of equal width; hind part almost double the length of fore part; trichomes of the transversal furrow of the pronotum dark yellow, not much contrasting with the black pronotum, and visibly consisting of a narrow anterior and a broader posterior part; distance between trichomes 1.3 times longer than width of each of the trichomes (when seen from above); central excavation rising towards scutellum; excavation glabrous and smooth except rugose upper end; equally rugose at both sides of median excavation; a small but distinct, glabrous and smooth oval imprint at anterior margin of hind portion of pronotum behind each trichome.

Elytra dull, with microgranulation and scattered wrinkling; each elytron with 3 rounded patches at characteristic sites (Fig. 2); all 3 patches demarkated by a lack of setae, shallow depression, and slightly raised margin; all 3 patches well marked, sometimes posterior patches more faint, level with surface, or slightly larger than anterior patch.

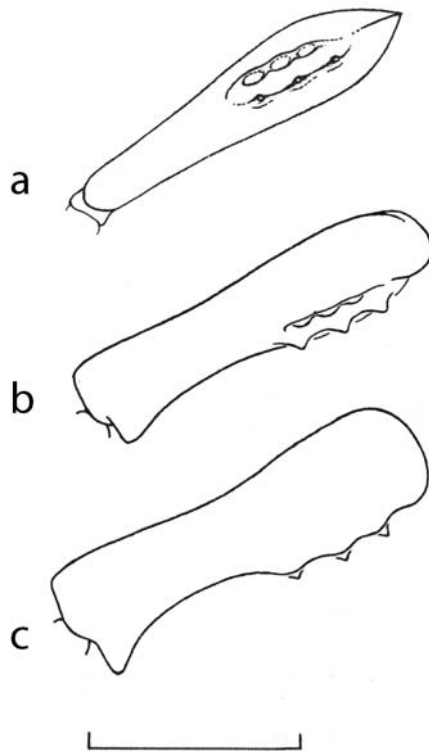


Fig. 5. *Paussus brancuccii* sp.nov., right antennal club, most frequent shape (a = posterior view; b = dorsal view, slightly rotated through longitudinal axis; c = plain dorsal view). Paratype male: NE Laos, Hua Phan prov., Phou Pan (Mt.), 20°12'N 104°01'E, 12.v.2011, 1300–1900m, leg. C. Holzschuh (BGUB). Scale = 1 mm (illustration E.Weber).

Hind wings present, apparently fully developed (not dissected).

Abdomen: Scraper of stridulatory organ present as a curved row of transverse “ridges” (spines not detectable at magnification >200 times) on the fused basal ventrites, and file present at inner base of femur, characteristic for *Paussus* s.l. (see DI GIULIO *et al.* 2014).

Pygidium: Disk with a small glossy, glabrous area (sometimes formed as faint impression) at the middle of the obtusely edged posterior margin; disk at both sides near to and parallel to the posterior margin with one longitudinal, slightly curved, low, obtuse costa; disk with scattered scaliform bristles, more densely arranged on the costiform protuberances, yet distinct marginal trichome fringe absent.

Legs stout with tibiae compressed; tibial spurs absent; tarsi underneath loosely set with short stout bristles with terminal tarsomere broadly glabrous along midline.

Male copulatory organ as illustrated (Fig. 7). Parameres glabrous at tip, apex of middle lobe acutely rounded; in fresh material a dark, sclerotized, flexible, rib-like structure is slightly emerging out of the soft tissue (part of eversible sac) at the subapical orifice; in dried specimens, with both expelled or retracted eversible

sac, this structure is recognized as the solid upper edge of the weakly sclerotized operculum which serves to close most of the subapical orifice in resting position; this operculum is reminiscent of the “ligula” of several other Carabidae (*Calosoma* s.l., *Carabus* s.l., see JEANNEL 1941, STURANI 1967, CASALE *et al.* 1982), but probably not homologous (Fig. 8); short, movable rod (strut) present, embedded in membranous tissue at the proximal end (basal aperture) of the middle lobe; condyle (proximal ventral articulation process for parameres) well developed.

Female genitalia: Gonostyli (retractile styles) (not dissected, visible part of projecting styles) of normal shape of *Paussus*, with subapical tuft of long bristles (see DARLINGTON 1950a, figs. 201–206).

Variability: Basic structure of head relief identical in all specimens, with the apically notched central proximal tubercle always highest; structure of the slightly

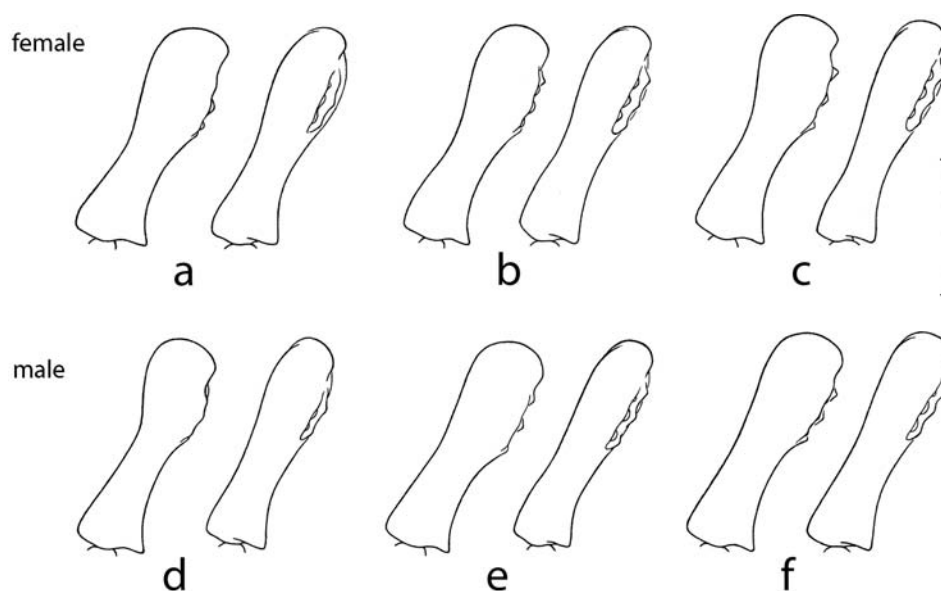


Fig. 6. *Paussus brancuccii* sp.nov., variation of antennal club, examples (cf. Fig. 5): dorsal view and view slightly rotated to the left through longitudinal axis; paratypes. **Upper row, female specimens:** **a** = Laos-NE, Houaphan prov., Phou Pane Mt., Ban Saleui env., 10.–22.V.2011 / 20°12'N 103°59'E, 1200–1600m, St. Jákl and Lao collectors leg.; **b** = Laos-NE, Houa Phan prov., 20°13'30"N 103°59'30"E, Ban Saleuy village env., 15–22.vi.2011, ~1350m, Vít. Kubáň & Lao coll. leg. / Secondary mountain forest, individual collecting, Laos 2011 Expedition, National Museum Prague, Czech Republic; **c** = Laos-NE, Houa Phan prov., 20°13'30"N 103°59'30"E, Ban Saleuy village env., 15–22.vi.2011, ~1350m, Vít. Kubáň & Lao coll. leg. / Secondary mountain forest, individual collecting, Laos 2011 Expedition, National Museum Prague, Czech Republic. **Lower row, male specimens:** **d** = Laos-NE, Houa Phan prov., 20°13'30"N 103°59'30"E, Ban Saleuy village env., 15–22.vi.2011, ~1350m, Vít. Kubáň & Lao coll. leg. / Secondary mountain forest, individual collecting, Laos 2011 Expedition, National Museum Prague, Czech Republic; **e** = Laos-NE, Houa Phan prov., 20°13'30"N 103°59'30"E, Ban Saleuy village env., 14–24.vi.2012, ~1350m, Vít. Kubáň & Lao coll. leg. / Secondary mountain forest, individual collecting, Laos 2012 Expedition, National Museum Prague, Czech Republic; **f** = Laos-NE, Houaphan prov., Phou Pane Mt., Ban Saleui env., 10.–22.V.2011 / 20°12'N 103°59'E, 1200–1600m, St. Jákl and Lao collectors leg. Scale = 1 mm (illustration E. Weber).

sunken area at the apex of the truncate frontal tubercle strongly variable: from closed pit with complete rim and even bottom through longitudinal keel (septum) dividing the area into two parts to posteriorly interrupted rim; antennal club see figs. 5, 6 and sexual dimorphism in the following.

Sexual dimorphism weak; no distinct difference between pubescence of fore, middle and hind tarsi in males and females; antennal club with carinate inner margin weaker in the middle in males, almost obliterated in the middle in females; apical margin of last ventral sternite with a median emargination in females, less pronounced in males; 3 denticles at lower margin of subapical furrow of the antennal club in males more

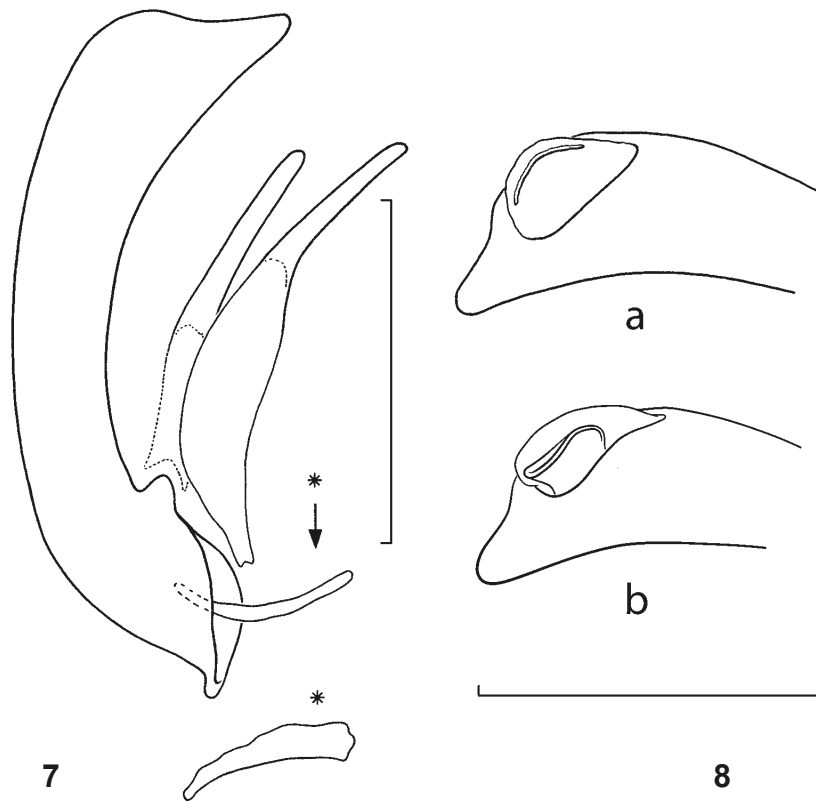


Fig. 7. *Paussus brancuccii* sp.nov., aedeagus. Middle lobe in dorsal view (left side) view, left and right paramere (* = sclerotized rod or strut in original position and broadest view). Paratype: NE Laos, Hua Phan prov., Phou Pan (Mt.), 20°12'N 104°01'E, 11.v.2011, 1300–1900m, leg. C. Holzschuh (BGUB). Scale = 1 mm (illustration E. Weber, A. Gertsch).

Fig. 8. *Paussus brancuccii* sp.nov., aedeagus (**a** = apical portion of middle lobe in ventral view (right side), showing fresh state of apical orifice with eversible sac swelling slightly out of orifice and dark, upper margin of aedeagal operculum visible; **b** = like a, yet dried specimen with forwardly bent, sclerotized operculum fully visible; see text). Paratype: NE Laos, Hua Phan prov., Phou Pan (Mt.), 20°12'N 104°01'E, 11.v.2011, 1300–1900m, leg. C. Holzschuh (BGUB). Scale = 1 mm (illustration E. Weber, A. Gertsch).

regular, obtuse and blunt or angular; in females sometimes irregular, sometimes one or all three denticles vestigial; eyes slightly larger in males.

Etymology. The new species is named for the late Michel Brancucci, entomology curator at NHMB and *spiritus rector* and head of the project “Beetle diversity of Laos”. The specific epithet is a proper noun in the genitive case.

Differential diagnosis. A dark coloured species with lighter appendages. Head dorsally with four tubercles characteristic of the *P. jousselinii* group *sensu stricto*. Antennal club elongate, dorso-ventrally compressed, narrowed between apical half and basal margin;

posteriorly with subapical narrow furrow. *P. brancuccii* sp.nov. is unmistakably characterized within the *P. jousselinii* group by the entire, uninterrupted basal margin of the antennal club with a smooth area instead of a distinctly marked deep depression or incision between the articulation to the (second and) first antennomere and the posterior basal angle. In addition, the new species is characterized by the combination of the following criteria: elytra with 3 rounded patches each, sometimes faint and difficult to see; antennal club with the apical half set with three glabrous, obtuse, sometimes weak or irregular denticles at the lower (ventral) edge of the posterior furrow; this furrow extending basally until the middle of the club; head with each of the frontal plates in front of frontal tubercle little longer than wide.

Host ant. Myrmicinae: *Tetramorium* sp. or *Pheidole* sp. Carolus Holzschuh collected some beetles together with ants. The male holotype specimen has two and a female paratype from the type locality has one *Tetramorium* sp. worker ant glued to a card and pinned together with the respective beetle. One female paratype collected by C. Holzschuh is accompanied by separately mounted *Tetramorium* sp. workers, *Pheidole* sp. minor workers and unidentified winged ants. Obviously, adjacent ant nests of two species were opened which also contained winged specimens ready to emerge. In total, more *Tetramorium* sp. workers were collected and preserved than *Pheidole* sp. minor workers. It is thus not clear if the host ant of *P. brancuccii* is a *Pheidole* or a *Tetramorium* species. Both genera are Myrmicinae and both genera have already been recorded as host ants of *Paussus* L. Some Paussini have been recorded with more than one ant genus (GEISELHARDT *et al.* 2007), yet in view of the array of chemical and acoustic communication systems of Paussini and their ant hosts it seems improbable that both *Pheidole* and *Tetramorium* are hosts of the same population of *P. brancuccii* sp.nov. at one location (see DI GIULIO *et al.* 2015).

Habitat. Most specimens are from the area around the Lao village of Ban Saleui in the valley and the adjacent wooded part of Phu Pane mountain. The village area is characterized by a mosaic of paddy fields, pastures, dense grass cover, and light, low, broad-leaved scrub. Further uphill habitats comprise mostly degraded primary and secondary tropical montane deciduous forest, patches of recently burnt forest and bamboo thickets (GEISER & NAGEL 2013). Altitude records on labels are in the range 1200 m to 2060 m a.s.l.. Mt. Phou Pane peaks at 2079m (Lao Statistics Bureau 2014). In addition to the open landscape around the village, specimens were also collected from secondary montane forest on Mt. Phou Pane.

Some specimens were collected from ants nests, by individual collecting, or by means of a flight intercept trap (FIT). Males and females were collected in such a FIT, i.e. both sexes were flying along the same track.

Local collectors and children from Ban Saleui village brought specimens, most of them probably also from ants' nests, others might have been attracted by light (the houses were illuminated the whole night) (pers. comm. of M. Brancucci, M. Geiser, C. Holzschuh).

The years 2009 to 2011 showed an average rainfall regime with slightly more rain in 2011. During the collecting period May to June in 2011 short, almost daily rains were standard while rainfall during the whole day was rare. On some days morning fog

occurred which disappeared soon with rising temperatures (C. Holzschuh pers. comm.). Further records are from collecting periods April to May in 2012, June to July 2013 and June 2014. The rainy season in this area lasts normally from April to October.

Distribution. Laos: Oudomxai and Huaphanh provinces, China: Guangxi province.

Remarks on variability of antennal furrow

The subapical furrow at the posterior part of the antennal club of most species of the *P. jousselinii* group represents the vestige of the large excavation present, for example, in the *P. cucullatus* group. The structural details of the furrow are more or less variable in different species. *P. brancuccii* sp.nov. shows a wide range of patterns in individuals of one locality (Fig. 6) with one state the most common (Fig. 5). A similar range of variation in shape and number of the subapical denticles of the antennal club is found across localities in the closer relative *P. curtisii* Westwood, 1864 (NAGEL 1983). A comparable variability was detected in presence, shape, colour, and size of the posterior carina of the antennal club of the phylogenetically distant *P. sphaerocerus* Afzelius, 1798 (LUNA DE CARVALHO 1967, NAGEL 1977). The sister species of the latter, *P. dissimulator* Reichensperger, 1928, however, does neither vary within specimens of one site nor across localities (NAGEL 1977).

This description of the range of variation within one single, geographically restricted population will hopefully help to assess the species delimitation of morphospecies and, at the same time, support a careful approach when interpreting structural differences as characters of possibly new species. This applies particularly to the rare Paussines with often only singletons available.

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References

[The publication date for nomenclatorial purposes and its source of references is given in square brackets at the end of the entry.]

- BOUSQUET Y. (2002): *Additions and corrections to the world catalogue of genus-groupnames of Geadephaga (Coleoptera) published by Wolfgang Lorenz (1998)*. Folia Heyrovskyana, Supplementum (Zlín, Czech Rep.) **9**: 1–78 [28 February 2002 (p.1, headline)]
- DARLINGTON P. (1950): *Paussid beetles*. Transactions of the American Entomological Society **76(2)** (June): 47–142 [25 August 1950 (p. [iii] of fasc. 2)]
- CASALE A., STURANI M. & VIGNA TAGLIANTI A. (1982): *Coleoptera. Carabidae I. Introduzione, Paussinae, Carabinae. Fauna d'Italia Vol. XVIII*. Bologna: Edizioni Calderini, xii+499pp. [January 1982 (footnote, verso of title page)]
- DI GIULIO A., FATTORINI S., MOORE W., ROBERTSON J., MAURIZI E. (2014): *Form, function and evolutionary significance of stridulatory organs in ant nest beetles (Coleoptera: Carabidae: Paussini)*. European Journal of Entomology **111(5)** (2014): 692–702, 10.14411/eje.2014.083 [Prepublished online September 12, 2014 (journal website & p.702, footer); published in print December 10, 2014 (journal website)]
- DI GIULIO A., MAURIZI E., BARBERO F., SALA M., FATTORINI S., BALLETO E. & BONELLI S. (2015): *The Pied Piper: A Parasitic Beetle's Melodies Modulate Ant Behaviours*. PloS One **10 (7)**: 1–15, S1 Dataset, S1–4 File, S1–2 Table [8 July 2015 (impressum, 1st page)]
- ERWIN T.L., MICHELI C. & CHABOO C.S. (2015): *Beetles (Coleoptera) of Peru: A Survey of the Families. Carabidae*. Journal of the Kansas Entomological Society **88(2)** (April): 151–162 [post 15 May 2015 (“Revised 15 May 2015”, footer p. 151)]
- GEISER M. & NAGEL P. (2013): *Coleopterology in Laos – an introduction to the nature of the country and its coleopterological exploration*. Entomologica Basiliensia et Collectionis Frey **34** [Special volume: BRANCUCCI M.†, NAGEL P., KOLIBÁČ J. & GEISER M. (eds): *Beetle diversity of Laos, Part 1.*], pp. 11–46 [30 November 2013 (verso of half title)]
- ICZN (International Commission on Zoological Nomenclature) (1999). *International Code of Zoological Nomenclature. Fourth Edition*. London: The International Trust for Zoological Nomenclature c/o The Natural History Museum, xix+306 pp. [(31 Dec.) 1999 (impressum, p.[ii]); with effect from 1 January 2000 (title page)]
- JEANNEL R. (1941): *Coléoptères Carabiques, Première Partie. Faune de France 39*. Paris: Librairie de la Faculté des Sciences, 571pp. [1 September 1941 (date of 1ère Partie, see p.1173 of 2e Partie)]
- KOLBE H. (1938): *Paussus-Arten Afrikas in den Nestern der Ameisen Pheidole megacephala in morphologisch-systematischer Beziehung*. Entomologische Blätter. Zeitschrift für Biologie und Systematik der Käfer **34 (1)**: 20–28 [3 March 1938 (header on wrapper of issue)]
- Lao Statistics Bureau (2014): *Statistical Yearbook 2013*. <<http://www.lsb.gov.la/en/Statisticalyearbook2013.php>>, accessed August 2015
- LORENZ W. (2005): *Systematic List of extant Ground Beetles of the World (Insecta Coleoptera “Geadephaga”: Trachypachidae and Carabidae incl. Paussinae, Cicindelinae, Rhysodinae)*. 2nd Edition. Tutzing: by the author, [iv]+530 pp. [1 May 2005 <<http://www.amazon.de/Systematic-Extant-Ground-Beetles-World/dp/3933896061>>, accessed 21. Dec. 2015]
- LUNA DE CARVALHO E. (1967): *Resultats de la Mission de Mir. Mrázek et Irena Korecká à la République de la Guinée (Coleoptera Carabidae Paussinae) (21e. Contribution à l'étude monographique des Paussides)*. Acta Musei Moraviae **52**: 203–208 [15 Dec. 1967 (impressum on unpaginated penultimate page of vol. 52)]
- LUNA DE CARVALHO E. (1989): *Essai monographique des Coléoptères Protopaussines et Paussines*. Memórias do Instituto de Investigação Científica tropical (Lisboa), 2a Série, N°70, 1987, 1028pp. [May 1989 (p.1028, colophon)]
- MARUYAMA M. (2014): *Four New Species of Ceratoderus Westwood, 1842 (Coleoptera, Carabidae, Paussinae) from Indochina*. Esakia **54**: 33–40. [31 March 2014: header p. 27, running footnote pp. 28–31]
- MOORE W. (2006): *Molecular Phylogenetics, Systematics, and Natural History of the Flanged Bombardier Beetles (Coleoptera: Adephaga: Carabidae: Paussinae)*. PhD Thesis, Department of Entomology, The University of Arizona, Tucson, 293 pp. [17 April 2006 (p.2, date of acceptance by Dissertation Committee)]

- MOORE W. & ROBERTSON J.A. (2014): *Explosive Adaptive Radiation and Extreme Phenotypic Diversity within Ant-Nest Beetles*. *Current Biology* **24**: 1–5 [20 Oct.2014 (header of article)]
- NAGEL P. (1977): *Revision der Paussus armatus-Gruppe (Coleoptera, Carabidae, Paussinae)*. Stuttgarter Beiträge zur Naturkunde, Serie A (Biologie) Nr. **293**: 1–95 [1 March 1977 (p.1 of issue, footnote)]
- NAGEL P. (1983): *Contribution to the knowledge of African ant nest beetles (Coleoptera, Carabidae, Paussinae)*. *Revue de Zoologie Africaine* **97(1)**: 73–93 [31 March 1983 (p. 73, headline)]
- NAGEL P. (2003): *Paussinae*. Pp. 208–211. In: I. LÖBL & A. SMETANA (eds): *Catalogue of Palaearctic Coleoptera, Vol. 1*. Stenstrup: Apollo Books, 819 pp. [30 May 2003 (verso of title page)]
- NAGEL P. & BEDNAŘÍK M. (2013): *A new flanged bombardier beetle from the Indomalayan Region (Carabidae, Paussinae, Paussini)*. *Entomologica Basiliensia et Collectionis Frey* **34** [Special Volume: BRANCUCCI M. †, NAGEL P., KOLIBÁČ J. & GEISER M. (eds), *Beetle diversity of Laos. Part I.*], pp. 53–60. Basel: Pro Entomologia [30 Nov. 2013 (verso of half title)]
- STURANI M. (1967): *Ligula ed Endofallo in alcune Specie appartenenti ai Generi Carabus Linnaeus (s.l.), Calosoma Weber e Campalita Motschoulsky (Coleoptera Carabidae)*. *Bollettino della Società Entomologica Italiana* **97(1–2)** (1967): 9–21 [20 March 1967 (header, title page of N° 1–2)]

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