

Taxonomic notes on the genus *Cyphochilus* (Coleoptera: Scarabaeoidea: Melolonthinae) (part 4) with description of eight new species from Indochina and China

Authors: Sabatinelli, Guido, and Phạm, Phú

Source: Revue suisse de Zoologie, 128(1) : 157-172

Published By: Muséum d'histoire naturelle, Genève

URL: <https://doi.org/10.35929/RSZ.0042>

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

Taxonomic notes on the genus *Cyphochilus* (Coleoptera: Scarabaeoidea: Melolonthinae) (part 4) with description of eight new species from Indochina and China

Guido Sabatinelli^{1*} & Phú Phạm²

¹ Muséum d'histoire naturelle, C.P. 6434, CH-1211 Genève 6, Switzerland

² Institute of Ecology and Biological Resources, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet, Cau Giay, Hanoi, Vietnam. E-mail: phupham.iebr@gmail.com

* Corresponding author: g.sabatinelli@hotmail.com

Abstract: *Cyphochilus brancuccii* n. sp., *C. hlai* n. sp., *C. nanzhao* n. sp., *C. keithi* n. sp., *C. nguyendui* n. sp., *C. nguyenvanvinhi* n. sp., *C. phamthinhae* n. sp., and *C. zianii* n. sp. are described based on the study of about 570 specimens. These species are largely distributed in Laos and Vietnam, marginally in Myanmar, Thailand, and South China. Previously they were confused with *C. ventriglaber* Brenske, 1903. The parameres and distribution of the nine species here treated are illustrated.

Keywords: Systematics - taxonomy - distribution - China - Thailand - Laos - Vietnam - Myanmar - Scarabaeidae.

INTRODUCTION

The members of the genus *Cyphochilus* Waterhouse, 1867 are quite exceptional among Melolonthini having relatively uniform external morphology in contrast to a much diversified morphology of the paramera. The diversified paramere morphology offers an extraordinary tool to easily identify male of the species and formulate hypotheses on interspecific relationships based on morphological affinities. The use of paramera for the identification of a *Cyphochilus* species was first adopted by Frey (1971), followed by Nomura (1977). During 2020, 22 new species were described and the paramera of their sibling species illustrated (Sabatinelli, 2020a, b, c). This study presents the results of the study of about 582 specimens from Indochina and China, previously often confused in the collections with *C. ventriglaber* Brenske, 1903.

MATERIAL AND METHODS

Specimens: The following acronyms set by Evenhuis (2007) identify the collections housing the examined material:

HNHM Hungarian Natural History Museum, Budapest, Hungary;

IEBR Institute of Ecology and Biological Resources, Hanoi, Vietnam;

IECA Institute of Entomology, Biology Centre of the Czech Academy of Sciences, České Budějovice, Czech Republic (ex coll. Aleš Bezděk);
 ISNB Institut Royal des sciences naturelles, Brussel, Belgium;
 MHNG Muséum d'histoire naturelle, Genève, Switzerland;
 MNHN Muséum national d'Histoire naturelle, Paris, France;
 MZUF Museo Zoologico "La Specola", Firenze, Italy;
 NHMB Naturhistorisches Museum, Basel, Switzerland;
 NHMW Naturhistorisches Museum, Wien, Austria;
 NMPC National Museum, Prague, Czech Republic;
 PCAR Andreas Reichenbach private collection, Leipzig, Germany;
 PCDK Denis Keith private collection, Chartres, France;
 PCMN Milan Nikodým private collection, Prague, Czech Republic;
 ZMHB Museum für Naturkunde, Berlin, Germany.
 ZMUH Zoologisches Institut und Zoologisches Museum, Universität von Hamburg, Germany.

All specimens in the collection of the first author (GS) were donated to the MHNG and integrated into the general collection. Type specimens held by the MHNG and registered in their collection database have a catalogue number with the format MHNG-ENTO-#####. Holotype specimen label information is reported *verbatim* and the used signs indicate:

- // separates data on different labels; if not indicated otherwise, they are on rectangular white labels;
 / line separation on same label;
 [...] contain comments of the authors relating to *verbatim* data;
 [sic] indicates a mistake in the original data label;
 (H) indicates handwritten;
 (P) indicates printed.

All other specimen information follows the standards of the journal, with specimen lots separated by the character combination “-”.

Male genitalia: Aedeagi were dissected and cleaned manually without any chemical treatment, then glued to a cardboard pinned under each specimen from which they were removed.

Descriptions: Due to the relative uniformity of the external morphology of *Cyphochilus*, in contrast with the high diversification of the parameres, only the characters useful for identification and for differential diagnosis are indicated in the descriptions. We refer to the detailed description of *C. ventriglaber* Brenske, 1903 for integrating the description.

Morphological terminology: Follows Torre-Bueno *et al.* (1989).

Images and Mapping: A Leica DFC425 camera in conjunction with a Leica M205-C stereo microscope was used to produce source images, which were subsequently processed using the software Zerene Stacker, and adjusted and grouped in plates using Adobe Photoshop. Distribution maps were generated using QGIS 2.8.2 based on the geographical coordinates.

Measurements and abbreviations: Characters, measurements, mensural procedures, and ratios are as follows:

- BL: Body length, measured from anterior margin of clypeus to apex of elytra, in dorsal view;
 BW: Body width, measured across the elytral humeri, in dorsal view;
 BWX: Greatest body width, measured across the elytral maximal width, in dorsal view;
 CW/L: Clypeal ratio, derived from width measured along clypeo-frontal suture divided by medial length of clypeus;
 F/O: Interocular ratio, derived from minimum frons width across eyes divided by transverse compound eye diameter in dorsal view;
 A2-7L/CL: Antennal ratio, derived from length of basal antennomeres 2-7 divided by antennal club length;
 PnW/L: Pronotal ratio, derived from pronotal greatest width divided pronotal length along midline, in dorsal view.

TAXONOMY

Genus *Cyphochilus* Waterhouse, 1867

Type species: *Melolontha candida* Olivier, 1789 by subsequent designation (Medvedev, 1951: 231).

Synthetic history of the genus: Waterhouse, 1867: description of the genus and of 5 species; Sharp, 1876: description of 3 species; Nonfried, 1893: description of one species; Fairmaire, 1902: description of 2 species; Brenske, 1903: description of 8 species; Dalla Torre, 1912: catalogue of 26 species; Moser, 1915: description of one species and syn. *ventrictectus* Brenske, 1903 = *ochraceosquamosus*; Arrow, 1938: description of one species; Medvedev, 1951: designation of the type species *C. candidus* (Olivier, 1789); Frey, 1971: description of one species; Sabatinelli & Pontuale, 1998: description of *Dedalopectus* with a redefinition of its closest genera *Malaisius* Arrow, 1941 and *Cyphochilus*; Li & Yang, 1999: revision of *Malaisius* and notes on *Cyphochilus*; Krajčik, 2012: catalogue of 32 species; Bezdek, 2016: catalogue of 12 Palaearctic species; Sabatinelli, 2020a: designation of several lectotypes, several synonymies proposed and 10 species described; Sabatinelli, 2020b: description of 9 new species and one subspecies, a checklist of valid 46 species; Sabatinelli, 2020c: designation of *C. tonkinensis* lectotype and description of 3 species.

Diagnosis: The following combination of characters distinguishes *Cyphochilus* from the other related genera of Melolonthinae in order of discriminating importance: labrum strongly asymmetric, decamerous antennae, antennal club of 3 antennomeres longer in the males than in females, upper part of the body covered only by scales, apical palpomere of maxillary palps narrow, elongate without any callus or excavation on its outer surface, claws long and with basal tooth; parameres generally strongly asymmetric. The asymmetry of the labrum alone, defines the members of the genus *Cyphochilus* among all Scarabaeoidea.

Remarks: Considering the species described in the present work, 56 species belong to the genus *Cyphochilus*. The genus is distributed in the Oriental part of the Palaearctic Region, as defined by Löbl & Smetana (2006) and marginally, in the very northern part of the Oriental Region. A synthetic history of the genus, full bibliographic references and an updated catalogue of species are provided by Sabatinelli (2020b) while the morphological affinities with other genera are discussed in Sabatinelli (2020a, b).

In the present work, we are treating a complex of species morphologically close to *Cyphochilus ventriglaber* having in common the following characters: body ovoid, larger in females; antennal club of males longer than antennomeres 2-7; eyes relatively small and not very produced externally; elytra

with visible interstriae although not very elevated; mesosternum not produced into apophysis; pygidium of males with ventral margin narrow; last ventrite of females as the proceeding one, smooth, shining, without punctures on medial part; aedeagus with median lobe not developed and parameres strongly asymmetric.

Considering the morphology of ventrites and aedeagus, the ventriglaber-complex of species can be further divided into three cluster of species and as such, the species are treated in this work.

Cluster A

Species with median part of ventrites smooth without scales or punctures; parameres slender, the distal part slightly bent dorsally or externally (Figs 1-6). This group includes: *Cyphochilus ventriglaber* and *C. nanzhao* n. sp.

Cyphochilus ventriglaber Brenske, 1903

Figs 1-3, 7

Cyphochilus ventriglaber Brenske, 1903: 381.

Type material examined: Holotype, ZMHB, ♂; VIETNAM // Tonkin / Montes Manson [sic, Mẫu Sơn, Lạng Sơn Province] / April, May 2-3000' / H. Fruhstorfer (P) // Type / 1089 / Brsk (H) // *Cyphochilus ventriglaber* / Brsk (H) // Coll. Brenske (P) // (Fig. 3a).

Additional material examined: 19 specimens. VIETNAM: *Lạng Sơn Province*: ZMHB: 1 ♀; MHNG: 3 ♂, 1 ♀; same data as holotype. – *Vĩnh Phúc Province*: NHMB: 3 ♂; Tam Đảo; 20-28.VI.1990; Jan Strnad leg. – NHMB: 1 ♂; Tam Đảo; 5-10.VI.1989; Brantlová leg. – IEBR: 1 ♂; Tam Đảo National Park; 3.VII.2003; Hoàng Vũ Tru leg. – *Cao Bằng Province*: IEBR: 3 ♂; Nguyễn Bình, Phia Oắc - Phia Đén National Park; 13.V.2010; 1500-1600 m; Hoàng Vũ Tru leg. – IEBR: 2 ♂; same locality as previous; 11.VIII.2012; Hoàng Vũ Tru leg. – *Hà Giang Province*: PCDK: 2 ♂, 2 ♀; Hà Giang Prov.; VI-VII.2012; Do Manh Cuong leg.

Redescription of holotype male

Body: Ovoid; BL: 22.5 mm, BW: 8.6 mm, BWX: 11.4 mm situated at midpoint of elytra; integument black excluding legs and appendices that are light brown; upper surface covered with ochraceous scales not forming spots or stripes but more densely aggregated along external margins of elytra where they are white; pygidium and abdomen without metallic reflex.

Head: Clypeus transverse with anterior margin largely rounded (CW/L: 3.2), laterally not continuous with canthus, flat, separated from frons by suture, with anterior margin slightly reflected; frons depressed medially, large, thus making eyes relatively small (F/O: 4.5), lateral margin near eyes not elevated; vertex depressed; antenna decamerous; antennal club trimerous, elongate, more than twice longer

than preceding antennomeres 2-7 (A2-7/CL: 0.4); footstalk with third and fourth antennomeres subequal in length; claws not cleft at apex, large at base and with basal tooth beneath, lower margin entire, dorsal margin uniformly curved; apical maxillary palpomere narrow (five times longer than wide), not excavated; labrum deeply sinuate, strongly asymmetric; mentum transverse, with Y-shaped carina.

Pronotum: Transverse (PnW/L: 2), with lateral margin angulated in the middle, not serrated, without setae, anterior and posterior margins not margined; anterior angles acute and prominent, basal angles obtuse and rounded; mesoventrum not produced between mesocoxae; metaventrum with long hairs; metepisternum narrow, more than three times longer than wide with metepimera small.

Elytra: With well-developed humeral callus and four elevated costae in addition to the sutural one, not reaching the apex of elytra where the surface is strongly angulate toward the pygidium.

Wings: Completely developed.

Abdomen: Ventrites with uniform scales, not aggregated at the lateral margins, connate, with sutures absent in middle; ventrite VI not retracting under ventrite V; distal margin of the ventrite VIII not sinuate; last two ventrites medially smooth, without scales or punctures; last spiracle located on suture between visible ventrite V and propygidium.

Pygidium: Triangular, convex, with distal margin not reflected and ventral surface narrowly developed, thus not mucronate.

Legs: Anterior coxae transverse, not prominent and contiguous to each other; mesofemur not enlarged; protibiae 3-toothed with the basal one more distant than the two distal; with internal spur, located between the basal and median external tooth; external margin of protibiae not transparent; meta- and mesotibiae without complete transverse carina only externally with a tubercle; dorsal margin of metatibiae without teeth or spines; tarsomeres thick and short, sparsely setaceous beneath and with sparse minute scales above; basimetatarsomere shorter than second; metacoxae not close to the mesocoxae.

Aedeagus: Endophallus membranous; median lobe not developed; parameres asymmetric, parameres slender (Fig. 2), right paramere with ventral and dorsal margin subparallel and apex enlarged and bent externally (Figs 1-2), left paramere with apex enlarged and bent dorsally, on dorsal margin at the base with a very small thorn (Figs 2-3).

Variability in males: BL: 23.3-25.4 mm (\bar{x} = 24.5; n = 11). Some well-preserved specimens have vestiture of the upper part of the body with more dense scales more often whitish; over eleven males specimens examined, nine have a scale vestiture white instead of ochraceous as the holotype.

Females and variability: Body more ovate than in males; BL: 22.3–22 mm ($n = 4$); BW: 9.2; BWX: 11.7; antennal club ovate, shorter than preceding antennomeres (A2-7/CL: 1.4); protibiae strongly 3-toothed with teeth almost equidistant with each other; wings and humeral callus as developed as in males; metacoxae not close to the mesotibiae as in males; ventrite VIII not excavated medially, smooth without scales or punctures; pygidium relatively convex with a larger base than in males, marginal apex not reflected, ventral surface very narrow almost absent.

Type locality: *Cyphochilus ventriglaber* was described from a series of specimens collected by members of the French Tonkin Expeditionary Corps during the colonization of Indochina, in the Mount Mẫu Sơn (21°45'12" N 106°57'00" E), where the French built a military base and a cluster of residential houses. Mount Mẫu Sơn name refers to a mountain in Lộc Bình District, Lạng Sơn Province, in northeast Vietnam. It is located about 170 km northeast of Hanoi and about 30 km east of Lạng Sơn City close to the border between Vietnam and China. The highest peak of Mount Mẫu Sơn reaches about 1600 m above sea level.

Distribution: This species is endemic to Vietnam and known from few specimens collected in the northeastern part across Lạng Sơn, Vĩnh Phúc, Cao Bằng and Hà Giang Provinces (Fig. 7).

Remarks: The male specimen preserved at the ZMHB has the exact labelling indicated in the description by Brenske for which he also indicated "Type 1089", thus the specimen has to be considered as holotype by original description. Several specimens of medium size *Cyphochilus* with elytra with elevated striae, from Northern parts of Thailand, Laos and Vietnam, have been attributed to *C. ventriglaber*. In reality, the aedeagal morphology distinguishes nine species, eight of which are described as new thereafter. Among them, *C. ventriglaber* is close to *C. nanzhao* n. sp. from which is easily recognizable by the shape of parameres. In *C. ventriglaber* the apex of right paramere has dorsal and ventral margins subparallel, enlarged and slightly bent externally at the apex; left paramere is enlarged and slightly bent dorsally at apex without any dorsal apophysis. In *C. nanzhao* the right paramere is narrowed then enlarged at apex and strongly bent dorsally; left paramere terminates in a point bent externally and a large thorn is present on the dorsal margin toward base



Figs 1-6. Paramera in right (apex to the right), dorsal (apex to the right) and left (apex to the left) view: (1-3) *Cyphochilus ventriglaber* Brenske, 1903, holotype; (4-6) *C. nanzhao* n. sp., holotype. Scale bars = 0.5 mm. (3a) Original labels of *C. ventriglaber* Typus.

(Figs 1-3 versus 4-6). The geographical distribution area of the two species is very distant separated by the Mekong Basin.

***Cyphochilus nanzhao* Sabatinelli n. sp.**

Figs 4-6, 7

Holotype: MHNG (MHNG-ENTO-85538); ♂; THAILAND // Thailand, Chiang Mai Prov. / Ang Khang region, 1600±100 m / 19°53'45"N 99°02'45"E / L. Dembický leg. 2-7.V.2009 (P) // Holotypus ♂ / *Cyphochilus* / *nanzhao* / G. Sabatinelli, 2021 (T on red) //.

Paratypes: 2 specimens. CHINA: Yunnan Province: NMPC: 1 ♂; Zizhi [Tengchong, Baoshan City], at light in the village; 25°43.7'N 98°34.1'E, 1995 m; 29.VI.8.VII.2016; J. Hájek & J. Růžička leg. – MHNG (MHNG-ENTO-85539): 1 ♀; W. Yunnan, 60 km Tengchong [Baoshan City], 2200 m, 20.V.2006; S. Murzin leg.

Description of the holotype male

Body: Subcylindrical, BL: 19.4 mm, BW: 7.6 mm, BWX: 9.7 mm situated at midpoint of elytra; integument black except for legs and appendices light brown; dorsal surface with dark-ochraceous scales more densely aggregated at the lateral margins and apex of elytra.

Head: CW/L: 3.4; anterior edges of clypeus largely rounded; frons deeply depressed, large, thus eyes

relatively small (F/O: 5.5); antennal club twice longer than antennomeres 2-7 (A2-7/CL: 0.5).

Pronotum: Transverse (PnW/L: 2.2), strongly convex; anterior angles right and basal angles obtuse.

Elytra: With four elevated costae, in addition to sutural one, not reaching the elytral apex. Thoracic ventra with short, white setation and scales; mesoventrum not developed or visible between the mesocoxae. Abdomen: ventrites medially smooth without scales or punctures; ventrite VIII medially depressed; pygidium ventral surface narrow and depressed medially.

Legs: Protibiae tridentate with basal teeth small; equally distant with each other.

Aedeagus: Parameres with median lobe not developed (Fig. 5); right paramere narrowed in the pre-apical portion then enlarged distally, curved dorsally and with an acute dorsal margin (Figs 4-5); left paramere much shorter than right ending in an acute point bent externally, dorsal margin with large vertical thorn (Figs 5-6).

Male paratype: BL: 20.2 mm; in this specimen the colour of scale vestiture of the upper part of the body is white instead of ochraceous as with the holotype.

Female paratype: Body larger than in males; BL: 19.7-21.5 mm; BW: 8.5; BWX: 10.6; antennal club ovate, shorter than preceding antennomeres 2-7 (A2-7/CL: 1.19), scale vestiture of the upper part of the body snow-white with lateral margins yellowish; ventrites uniformly with scales and punctures.

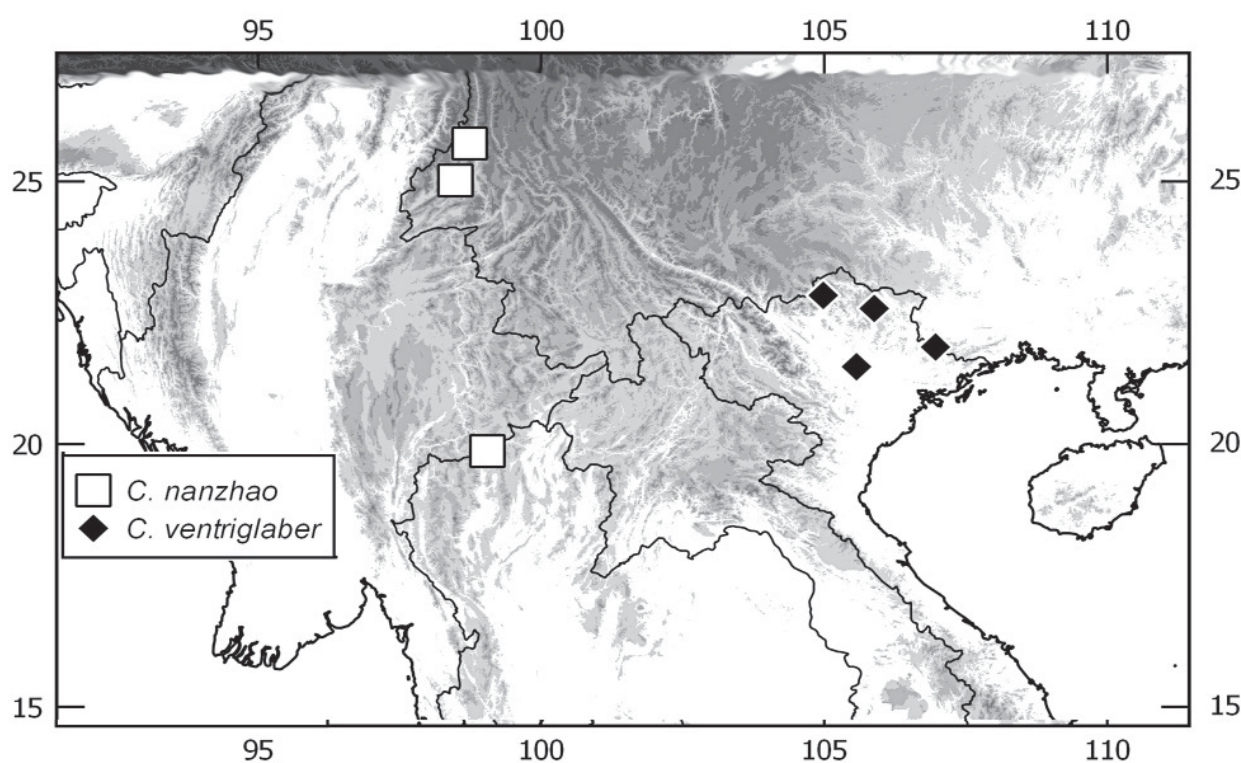


Fig. 7. Geographical distribution of *C. ventriglaber* and *C. nanzhao* n. sp.

Etymology: Nanzhao, literally Southern Zhao, was a dynastic kingdom that flourished in what is now southern China and Southeast Asia during the 8th and 9th centuries. It was centred on present-day Yunnan. Noun in apposition.

Type locality: Ang Khang is located in the Fang district of Chiang Mai Province in Thailand; it is part of the Daen Lao Range that straddles both sides of the Burmese-Thai border, the peak of Doi Ang Khang is 1928 m.

Distribution: Only three specimens are known: the holotype from north Thailand and 2 paratypes from West Yunnan bordering Myanmar (Fig. 7). I examined also a couple of specimens from Mount Emei, in Emeishan City, Sichuan; however, the male parameres are quite different from those of the holotype and paratype. Due to the distance of Mount Emei from Thailand and West Yunnan, I did not include those Sichuan specimens in the type series as it could be a different species for which the study of much more specimens and populations is necessary in order to decide their systematic value.

Remarks: *Cyphochilus nanzhao* n. sp. is morphologically related to *C. ventriglaber*, please see above for their differential diagnosis.

Cluster B

Species with median part of ventrites smooth without scales or punctures; parameres stocky, right paramere larger with distal part curved, left paramere with distal part curved externally (Figs 8-19). This group includes *Cyphochilus brancuccii* n. sp., *C. hlai* n. sp., *C. nguyenanvinhi* n. sp. and *C. zianii* n. sp. These species are very similar in external morphology and pragmatically can be only distinguished by the paramere morphology which is very distinctive for each species as reported in Table 1.

Cyphochilus brancuccii Sabatinelli n. sp.

Figs 8-10, 31

Holotype: MHNG (MHNG-ENTO-85546); ♂; LAOS // Laos, Phongsali Province / Muang Khoa [Khua] district / Ban Phianglan, [21.0778° N, 102.5097° E] May 2014 (P) // Holotypus ♂ / *Cyphochilus* / *brancuccii* n. sp. / G. Sabatinelli, 2021 (T on red) //.

Paratypes: 221 specimens. LAOS, Phongsali Province: MHNG: 30 ♂; 7 ♀; same data as holotype – Houaphanh Province: ZMHB: 46 ♂♂, 20 ♀♀; Ban Saleui, Phou Pan Mt. [Phu Phan Mt.]; 20°12'N 104°01'E, 1300-1900 m; 11.IV.-15.V.2012; C. Holzschuh leg. – NMPC: 1 ♂, 1 ♀; PCMN: 1 ♂; same locality as previous; 20°15'N 104°02'E, 1500-2000 m; 26.IV.2001; D. Hauck leg. – PCDK: 1 ♂, 1 ♀; Ban Saleui; 15.IV.5.V.2012;

Tingaud leg. – NMPC: 6 ♂; Ban Saleui, 30 km S of Xam Neua; 20°13'39"N 103°59'33"E, 1500 m, 6-17.V.2004; P. Kresl leg. – NHMB: 8 ♂, 1 ♀; Phou Pane Mt. [Phu Phan Mt.]; ~23°[?]'N 104°00'E, 1-16.VI.2009, 15350-1500 m, M. Brancucci leg. – NHMB: 8 ♂; same locality and date as previous; 20°13'09"N 103°59'54"N-104°00'03"N; 1480-1550 m; Z. Kraus leg. – NMPC: 31 ♂, 4 ♀; IECA: 5 ♂, 1 ♀; same locality as previous; 20°13'09"N 103°59'54"E-104°00'03"E, 1480-1510 m; 22.IV.-14.V.2008; V. Kubán leg. – NMPC: 1 ♂, 1 ♀; IECA: 3 ♀; same locality as previous; 20°15'N 104°02'E; 1500-2000 m, 26.IV.-11.V.2001; J. Bezděk leg. – NHMB: 14 ♂; same locality as previous; 20°12'N 104°01'E, 1500-1900 m; 17.V.-3.VI.2007; M. Brancucci leg. – NMPC: 12 ♂, 2 ♀; same locality as previous; 17.V.-3.VI.2007, ~1750 m; V. Kubán leg. – NMPC: 6 ♂; NHMB: 7 ♂; Phu Phan Mt.; ~1750 m, 20°12.328'N 104°00.621'E, 17.V.-3.VI.2007; V. Kubán leg. – NHMB: 1 ♂; Ban Saleui to Phou Pane Mt. [Phu Phan Mt.]; 20°12-13.5'N 103°59.5'-104°01'E, 1340-1870 m; 10.V.-16.VI.2009; M. Brancucci & local collector leg. – NHMB: 1 ♂; same locality as previous; 1300-1900 m; 9-17.VI.2009; M. Geiser leg. – NHMB: 1 ♂; same locality as previous; 1300-1900 m; IV.2012; K. Sisoutham & local collector leg.

Description of the holotype male

Body: Ovoid, BL: 19.4 mm, BW: 7.6 mm, BWX: 9.7 mm situated at midpoint of elytra; dorsal integuments black, ventral integuments, legs and appendices reddish-brown; dorsal surface with dirty-white scales more densely aggregated at the lateral margins and apex of elytra where they are yellowish.

Head: CW/L: 3.4; anterior angles of clypeus largely rounded, anterior margin straight; frons depressed, large, thus eyes relatively small (F/O: 5.5); antennal club twice longer than antennomeres 2-7 (A2-7/CL: 0.5).

Pronotum: Transverse (PnW/L: 2.2), strongly convex; anterior angles right and basal angle obtuse.

Elytra: With four elevated costae, in addition to sutural one, not reaching the elytral apex.

Thoracic sterna: With short, white setation and scales; mesoventrum not developed nor visible between the mesocoxae.

Abdomen: Ventrites medially smooth without scales or punctures.

Pygidium: Ventral surface narrow.

Legs: Protibiae tridentate with basal teeth small; the two apical teeth close to each other.

Aedeagus: Parameres with median lobe not developed (Fig. 9); right paramere narrowed in the pre-apical portion then strongly enlarged distally, curved dorsally and with an acute dorsal margin (Figs 8-9); left paramere much shorter than right, ending in an acute point bent externally, dorsal margin with a preapical large thorn directed externally (Figs 9-10).

Male paratypes: BL: 19.2-23.3 mm ($x = 20.2$; $n = 50$); one-fourth of male specimens have brown scale vestiture instead of dirty-white as in holotype.

Female paratypes: Body larger than in males; BL: 21.3-25.2 mm ($x = 23.5$; $n = 25$); BW: 8.5; BWX: 10.6; antennal club ovate, shorter than preceding antennomeres 2-7 (A2-7/CL: 1.2); in some specimens, legs are lighter coloured than ventral integuments; all females specimens have vestiture scales dirty-white, never brown as in some males.

Etymology: The species is dedicated to the late Michel Brancucci who starting in 2003, contributed fundamentally to many of new findings among beetle diversity of Laos; this act is to keep alive the memory of a highly respected colleague and my personal mentor.

Type locality: Muang Khua is a village in Laos, near the Vietnamese border, in the province of Phongsali.

Distribution: *Cyphochilus brancuccii* n. sp. along with *C. nguyendui* n. sp. is one of the most abundant *Cyphochilus* species in the collections. *C. brancuccii* is distributed in North Laos in the Phongsali and mainly Houaphanh provinces (Fig. 31).

The first author (GS) would like to point out that during some years Mr Li Jingke, a Chinese trader, sold beetles, including *Cyphochilus*, from improbable collecting locations. For this reason although we examined specimens of *C. brancuccii* sold by this trader putatively from Yunnan, Myanmar, Vietnam and Cambodia, they were not included in the type series. The presence of *C. brancuccii* outside of Laos should be confirmed.

Remarks: For the differential diagnosis with other close species of this informal subgroup see Table 1 and Figs 8-19.

***Cyphochilus hlai* Sabatinelli n. sp.**

Figs 11-13, 31

Holotype: NMPC; ♂; CHINA, Hainan: // China, Hainan isl. 4-6.V.2011 / Limushan [Limu Shan] Mt. / forest administration centre (at light) / 19°10'30"N 109°44'33"E, 630 m / M. Fikáček, V. Kubeček & L. Li leg. (P) // Holotypus ♂ / *Cyphochilus* / *hlai* n. sp. / G. Sabatinelli, 2021 (T on red) //.

Paratypes: 2 specimens. MHNG (MHNG-ENTO-85540): 1 ♂; NMPC: 1 ♀; same data as holotype.

Description of the holotype male

Body: Ovoid, BL: 23.9 mm, BW: 8.9 mm, BWX: 11.5 mm situated at midpoint of elytra; dorsal and ventral integuments black, legs and appendices reddish-brown; dorsal surface with dirty-white scales more densely aggregated at the lateral margins and apex of elytra where they are yellowish.

Head: CW/L: 3.4; anterior angles of clypeus largely rounded, anterior margin straight; frons depressed, large, thus eyes relatively big (F/O: 3.4); antennal club twice longer than antennomeres 2-7 (A2-7/CL: 0.5).

Pronotum: Transverse (PnW/L: 2), strongly convex; anterior and basal angles right.

Elytra: With four elevated costae, in addition to sutural one, not reaching the elytral apex.

Thoracic sterna: With short, white setation and scales; mesoventrum not developed or visible between the mesocoxae.

Abdomen: Ventrites medially smooth without scales or punctures, last ventrite depressed medially.

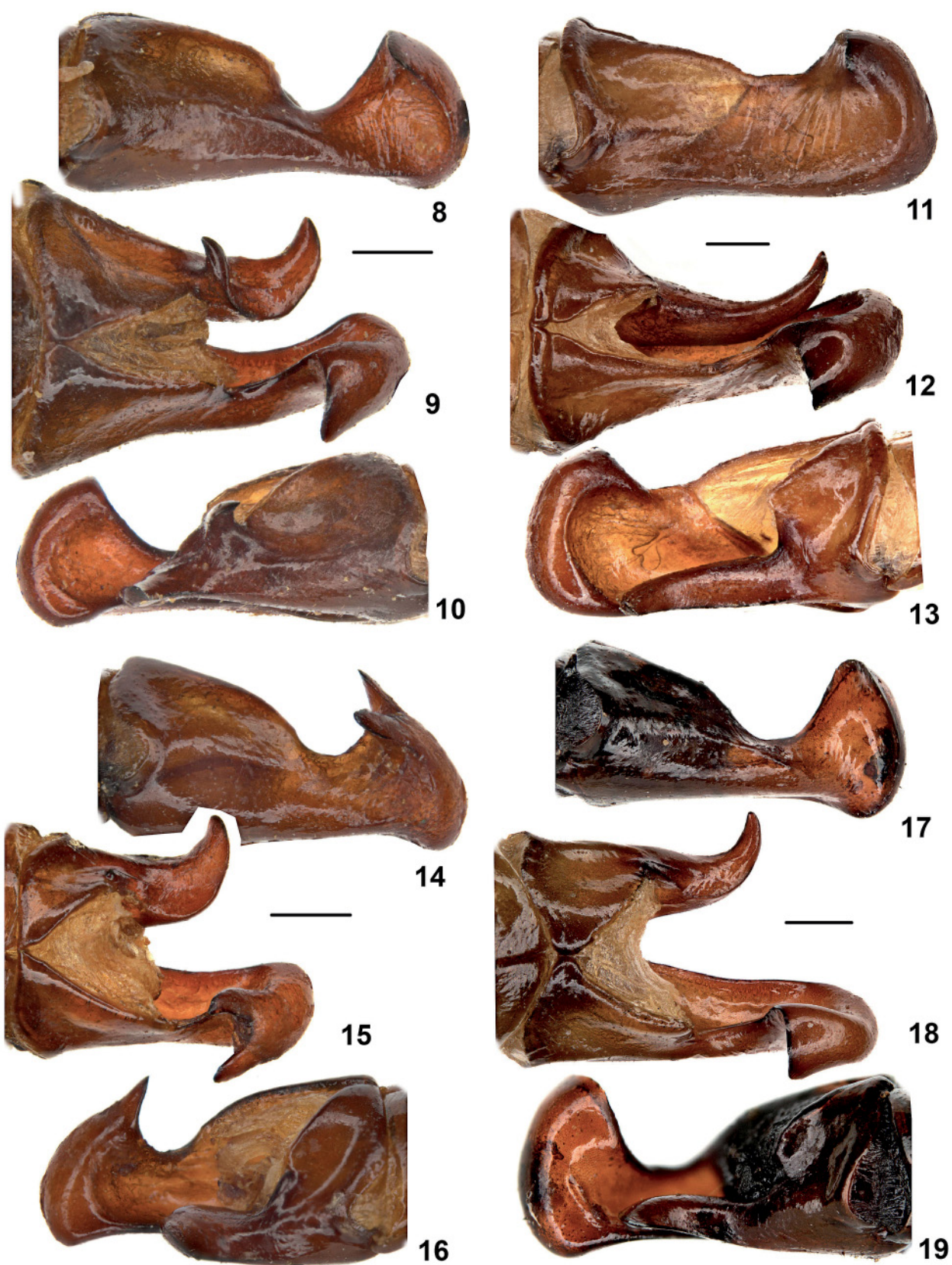
Pygidium: Ventral surface narrow.

Legs: Protibiae tridentate with basal teeth small; the two apical teeth close to each other.

Aedeagus: Parameres with median lobe not developed (Fig. 12); right paramere large with apex curved

Table 1: Differential diagnosis for paramera of *Cyphochilus brancuccii* n. sp., *C. hlai* n. sp., *C. nguyenvanvinhi* n. sp. and *C. zianii* n. sp.

Species	Right paramere	Left paramere
<i>Cyphochilus brancuccii</i>	narrowed in the pre-apical portion then strongly enlarged distally, curved dorsally and with an acute dorsal margin (Figs 8-9);	shorter than right one, ending in an acute point bent externally, dorsal margin with a preapical large thorn directed externally (Figs 9-10).
<i>Cyphochilus hlai</i>	large with apex curved dorsally (Figs 11-12);	shorter than right one, ending in an acute point bent externally, dorsal margin with a large thorn directed externally (Figs 12-13).
<i>Cyphochilus nguyenvanvinhi</i>	distally enlarged and curved dorsally with bifid apex (Figs 14-15);	shorter than right one ending in an acute point curved externally (Figs 15-16).
<i>Cyphochilus zianii</i>	distally enlarged, curved dorsally and truncate at apex (Figs 17-18);	shorter than right one ending in an acute point curved externally (Figs 18-19).



Figs 8-19. Paramera in right (apex to the right), dorsal (apex to the right) and left (apex to the left) view: (8-10) *Cyphochilus brancuccii* n. sp., holotype; (11-13) *C. hlai* n. sp., holotype; (14-16) *C. nguyenvanvinhi* n. sp., holotype; (17-19) *C. zianii* n. sp., holotype. Scale bars = 0.5 mm.

dorsally (Figs 11-12); left paramere much shorter than right ending in an acute point bent externally, dorsal margin with a large thorn directed externally (Figs 12-13).

Male paratype: BL: 23.5 mm; no major differences from holotype.

Female paratype: Body larger than in males; BL: 22.2 mm; BW: 9.7; BWX: 12.9; antennal club ovate, shorter than preceding antennomeres 2-7 (A2-7/CL: 1.1).

Etymology: The Hlai, also known as Li or Lizu, are one of the 56 ethnic groups officially recognized by the People's Republic of China; the vast majority of Hlai live off the southern coast of China on Hainan Island where they are the largest minority ethnic group.

Type locality: Limu Shan National Forest Park in Hainan Island, covers a large area of basically primitive forests; the highest mountain in the forest park is Da Limu Ling (1412 m), and there are 19 mountains higher than 1000 m, 33 mountains higher than 800 m, 32 mountains of 500-800 m height, where the *Cyphochilus* specimens were collected and 9 mountains under 500 m.

Distribution: *Cyphochilus hlai* n. sp. appears endemic to Hainan Island (Fig. 31).

Remarks: For the differential diagnosis with other close species of this informal subgroup see Table 1 and Figs 8-19.

Cyphochilus nguyenvanvinhi
Sabatinelli & Phạm n. sp.
Figs 14-16, 31

Holotype: IEBR; ♂; VIETNAM, Vĩnh Phúc Province: // North Vietnam - / Tam Dao [Đào], 29.IV.1991 / leg. M. Fujoka & R. Muramoto (P) // Holotypus ♂ / *Cyphochilus* / *nguyenvanvinhi* n. sp. / G. Sabatinelli & P. Phạm, 2021 (T on red) //.

Paratypes: 73 specimens. VIETNAM, Vĩnh Phúc Province: IEBR: 1 ♀; MHNG (MHNG-ENTO-85547): 1 ♂, 3 ♀; same data as holotype – MHNG: 3 ♂; HNHM: 1 ♂; PCMN: 3 ♂; ZMUH: 10 ♂; 75 km NW from Hanoi, Tam Đảo; 15.V.-16.VI.-1991; E. Jendek leg. – SMSN: 1 ♂; same locality as previous; 20.IV.1986, 900 m. – SMSN: 1 ♀; same locality as previous; 15-17.IV.1986, 900 m – NHMB: 5 ♂, 5 ♀; Tam Đảo; 20-28.VI.1990; J. Strnad leg. – NHMB: 2 ♂, 1 ♀; same locality as previous; 5.10.VI.1989; Brantlová leg. – NMPC: 1 ♀; same locality as previous; 11.VI.[?].1988[?]; J. Jelínek leg. – NMPC: 2 ♀; same locality as previous; M. Hrasdký leg. – NMPC: 2 ♂, 3 ♀; same locality as previous; 17-21.V.1990; J. Horák leg. – NHMB: 1 ♂; NMPC: 1 ♂; same locality as

previous; 13-24.VI.1989; A. Olexa leg. – NHMB: 1 ♂; same locality as previous; 3-11.VI.1985; Navrátil leg. – NHMB: 1 ♂; same locality as previous; 20-27.VI.1990; A. Olexa leg. – NHMB: 1 ♂; same locality as previous; 6-9.V.1990; P. Pacholátko leg. – NHMB: 1 ♀; same locality as previous; 6-9.V.1990; P. Pacholátko leg. – PCMN: 2 ♂; same locality as previous; 20.V.1991; Křeček leg. – MNHN: 1 ♂; same locality as previous – ISNB: 1 ♂; IEBR: 4 ♂; Tam Đảo National Park; 3.VII.2003; Hoang Vu Tru leg. – IEBR, 13 ♂; same locality as previous; 27-28.V.2004, 1000 m; Hoang Vu Tru leg. – VIETNAM, Lào Cai Province: NHMB: 1 ♂; Sapa [Sa Pa]; 11-19.VI.1990; Brantlová leg. –

Description of the holotype male

Body: Subparallel, BL: 19.9 mm, BW: 8.6 mm, BWX: 10.7 mm situated at midpoint of elytra; dorsal and ventral integuments black, legs and appendices reddish-brown; dorsal surface with dirty-white scales more densely aggregated at the lateral margins and apex of elytra where they are yellowish.

Head: CW/L: 3.3; anterior angles of clypeus largely rounded, anterior margin straight; frons depressed, large, thus eyes relatively big (F/O: 3.4); antennal club twice longer than antennomeres 2-7 (A2-7/CL: 0.5).

Pronotum: Transverse (PnW/L: 1.9), strongly convex; anterior and basal angles right.

Elytra: With four elevated costae, in addition to sutural one, not reaching the elytral apex.

Thoracic sterna: With short, white setation and scales; mesoventrum not developed or visible between the mesocoxae.

Abdomen: Ventrites medially smooth without scales or punctures, last ventrite depressed medially.

Pygidium: Ventral surface narrow. **Legs:** protibiae tridentate with basal teeth small; the two apical teeth close to each other.

Aedeagus: Parameres with median lobe not developed (Fig. 15); right paramere distally enlarged and curved dorsally with bifid apex (Figs 14-15); left paramere much shorter than right ending in an acute point curved externally (Figs 15-16).

Male paratypes: BL: 19-23.5 mm (\bar{x} = 22.7; n = 35); all specimens have same dirty-white scale vestiture as the holotype, no colour variations observed.

Female paratypes: Body ovoid larger than but not longer than in males; BL: 22.4-23.6 mm (n = 13); BW: 8.5; BWX: 11.8; antennal club ovate, shorter than preceding antennomeres 2-7 (A2-7/CL: 1.3); all specimens have same dirty-white scale vestiture as males, no colour variations observed.

Etymology: Prof. Nguyễn Văn Vịnh is a lecturer at Vietnam National University, University of Science in Hanoi, vice-head of the Faculty of Biology. As the head of the Department of Applied Zoology, he was supervisor of Phạm in his bachelor and master degrees.

He has been studying the diversity and conservation of mayflies in Vietnam since 2000.

Type locality: Tam Đảo is a rural district of Vĩnh Phúc Province in the Red River Delta region of northern Vietnam.

Distribution: Tam Đảo National Park, where probably most of the specimens were collected, is an area in northern Vietnam about 85 km northwest of Hanoi (Fig. 31). The Park is based in the Tam Đảo range, which runs 80 km from north west to south east and is one of the terminal spurs of a larger mountainous area in the Northwest region of Vietnam, and has more than 20 peaks with altitudes of over 1000 m. Due to the tall mountainous range that splits the area into two parts, the NP climatic condition is divided into two areas with different rainfalls. This difference and some other factors such as the effect of human activity divide the park into some smaller climatic zones and eight kinds of forest types, which increase the biodiversity in the park. Several species of insects are endemic to Tam Đảo area and *Cyphochilus nguyenvanvinhi* n. sp. could be one of them except for an isolated record in Sa Pa (Lào Cai Province).

Remarks: For the differential diagnosis with other close species of this informal subgroup see Table 1 and Figs 8-19.

***Cyphochilus zianii* Sabatinelli & Phạm n. sp.**

Figs 17-19, 31

Holotype: IEBR; ♂; LAOS, Xiangkhouang Province // NE Laos, 1500 m / Xing Khang [Xiangkhouang], 20.V.1996 (P) // Holotypus ♂ / *Cyphochilus* / *zianii* n. sp. / G. Sabatinelli & P. Phạm, 2021 (T on red) //.

Paratypes: 52 specimens. LAOS, Xiangkhouang Province: MHNG, 1 ♂, 1 ♀; Xiangkhouang Plateau; [19.6093° N, 103.7289° E], 1500 m; 20.V.1996; local collector – Phongsali Province: NHMB: 8 ♂, 3 ♀; MHNG (MHNG-ENTO-85548, 85549) 1 ♂, 1 ♀; Phongsali env.; 21°41'2"N 102°06'8"E, ~1500 m, 28.V-20.VI.2003; M. Brancucci leg. – NMPC: 3 ♂, 1 ♀; same data as previous; V. Kubán leg. – NMPC: 1 ♂, 5 ♀; same locality as previous; 6-17.V.2004; V. Kubán leg. – VIETNAM, Sơn La Province: IEBR: 1 ♂; Thuận Châu, Cópia Nature Reserve; [21.3901° N, 103.6363° E] 7.VI.2008; Le Xuan Hue leg. – IEBR: 7 ♂; same locality as previous; 28.IV-2.V.2016, 1500 m; Hoang Vu Tru leg. – Hòa Bình Province: IEBR: 2 ♂; Mai Châu District, Hang Kia-Pa Co Nature Reserve; [20.6901° N, 105.0090° E] 19-28.IV.2002, 1100-1200 m; Hoang Vu Tru leg. – Lào Cai Province: NHMW: 1 ♂; WNW Sa Pa, Tram Ton pass; 22°21'09"N 103°46'28.6"E, ~1900 m; 22.VI.2017; Vietnam expedition 2017 NHMW, CNC, H. Schillhammer,

R. Schuh, D. Zimmermann, A. Brunke, H. Douglas leg. – ISNB: 2 ♂; Lào Cai; 1920; Vitalis de Salvaza & Madame A. Vuillet [leg] – ISNB: 1 ♂; Chapo [Sa Pa, ca. 22°20'N 103°50'E]; Vitalis de Salvaza leg. – Bắc Kạn Province: HNHM: 1 ♂; Ba Be National Park, Na Mam forest; 22.417137°N 105.632505°E, 200 m; 17-19.IV.2010, at light, VN2020PL_17; L. Papp, L. Peregovits & Z. Soltész leg. – NHMB: 4 ♂, 4 ♀; same locality as previous; 6-17.V.2004; M. Brancucci leg. – NHMB: 1 ♂, 1 ♀, Ban Sano Mai; [21.3466° N, 102.0511° E] ~1150 m; 19-26.V.2004; M. Brancucci leg. – TONKIN without other information: ISNB: 2 ♂; sub *ochraceosquamosus* Moser; coll. R. Ley.

Description of the holotype male

Body: Subparallel, BL: 20.8 mm, BW: 9.2 mm, BWX: 11 mm situated at midpoint of elytra; dorsal and ventral integuments black, legs and appendices reddish-brown; dorsal surface with white-yellowish scales more densely aggregated at the lateral margins and apex of elytra where they are yellowish.

Head: CW/L: 3.2; anterior angles of clypeus largely rounded, anterior margin straight; frons depressed, large, thus eyes relatively big (F/O: 3.6); antennal club twice longer than antennomeres 2-7 (A2-7/CL: 0.5).

Pronotum: Transverse (PnW/L: 2.1), strongly convex; anterior angles acute, basal angles obtuse.

Elytra: With four elevated costae, in addition to sutural one, not reaching the elytral apex.

Thoracic sterna: With short, white setation and scales; mesoventrum not developed or visible between the mesocoxae.

Abdomen: Ventrites medially smooth without scales or punctures, last ventrite depressed medially.

Pygidium: Ventral surface narrow.

Legs: protibiae tridentate with basal teeth small; the two apical teeth close to each other.

Aedeagus: Parameres with median lobe not developed (Fig. 18); right paramere distally enlarged and curved dorsally truncate at apex (Figs 17-18); left paramere much shorter than right ending in an acute point curved externally (Figs 18-19).

Male paratypes: BL: 19-22.5 mm ($x = 21.3$; $n = 19$); most of specimens have the same white-yellowish scale vestiture as the holotype with the exception of two specimens from Sa Pa (Vietnam) with brown scale vestiture similar to some specimens of *C. brancuccii* n. sp.

Female paratypes: Body ovoid generally bigger than in males; BL: 20.5-24.2 mm ($n = 9$); BW: 9.6; BWX: 12; antennal club ovate, shorter than preceding antennomeres 2-7 (A2-7/CL: 1.2); all specimens have the same dirty-white scale vestiture as the holotype and denser in some specimens.

Etymology: Stefano Ziani is a reputed specialist of coprophagous Scarabaeidae, a good friend and

a valuable advisor on the complicated matters of taxonomy.

Type locality: Xiangkhouang Province is characterized by rolling hills and grassland whose elevation ranges between 336 and 2257 m. The province borders Luang Prabang Province to the northwest, Houaphanh Province to the northeast, Vietnam to the east, Bolikhamsai Province to the southeast, and Vientiane Province to the southwest. It maintains a National Biodiversity Conservation Area with a high level of biodiversity and protecting a number of endangered species.

Distribution: *Cyphochilus zianii* n. sp. has a relatively large distribution in northeast Laos: Xiangkhouang and Phongsali Provinces, and in northern Vietnam: Son La, Hòa Bình, Lào Cai, and Bắc Kạn Provinces (Fig. 31).

Remarks: Some specimens from Sa Pa (Lào Cai Province) have the right paramere sinuate instead of straight. For this reason, they are excluded from the type series of *C. zianii* since the meaning of such morphological differences needs to be better investigated with additional sampling. For the differential diagnosis with other close species of this informal subgroup see Table 1 and Figs 8-19.

Cluster C

Species with median part of ventrites with scales, if scales were rubbed off, punctures are present; parameres subtriangular in lateral view with apical part thin, right paramere bearing on its dorsal margin a thorn-like process directed externally (Figs 20-28). This group includes *Cyphochilus keithi* n. sp., *C. nguyendui* n. sp., *C. phamthinhae* n. sp. which can be easily distinguished by the parameres morphology which is very distinctive for each species (Figs 20-28).

Cyphochilus keithi Sabatinelli n. sp.

Figs 20-22, 32

Holotype ♂: MHNG (MHNG-ENTO-85541); MYANMAR // Myanmar, 21.V.98 [1998] / Putao [Putao-O], 65 km NW / 1250 m ZiYarDam [Ziyardam, 27.3182N, 97.4057E] / Murzin & Siniaev leg. (P) // Holotypus ♂ / *Cyphochilus keithi* n. sp. / G. Sabatinelli, 2021 (T on red) //.

Paratypes: 1 specimen. PCDK: 1 ♂; same data as the holotype.

Description of the holotype male

Body: Subparallel, BL: 18.7 mm, BW: 8.2 mm, BWX: 10.2 mm situated at midpoint of elytra; dorsal and ventral integuments black, legs and appendices reddish-brown; dorsal surface with white-yellowish scales more

densely aggregated at the lateral margins and apex of elytra where they are yellowish.

Head: CW/L: 3.3; anterior angles of clypeus largely rounded, anterior margin straight; frons depressed, large, thus eyes relatively small (F/O: 5); antennal club twice longer than antennomeres 2-7 (A2-7/CL: 0.4).

Pronotum: Transverse (PnW/L: 2.2), strongly convex; anterior angles acute, basal angles obtuse.

Elytra: With four elevated costae, in addition to sutural one, not reaching the elatral apex.

Thoracic sterna: With short, white setation and scales; mesoventrum not developed or visible between the mesocoxae.

Abdomen: Ventrites medially smooth without scales or punctures, last ventrite depressed medially.

Pygidium: Ventral surface narrow.

Legs: Protibiae tridentate with basal teeth small; the two apical teeth close to each other.

Aedeagus: Parameres with median lobe not developed (Fig. 21); right paramere on dorsal margin with a small thorn-like process directed externally (Figs 20-21); left paramere slightly shorter than right narrowed distally (Figs 21-22).

Male paratype: BL: 19 mm; without substantial morphological differences from the holotype.

Etymology: Denis Keith is a friend and entomologist who published several works on Scarabaeidae of Southeast Asia and kindly provided the specimens for this study.

Type locality: Ziyardam, the last village to the North West of Myanmar, is home to the Rawang tribe; it is situated in the Phonganrazi National Park (Fig. 32), where there are present rare species of flora and fauna in a conservation area of endangered species.

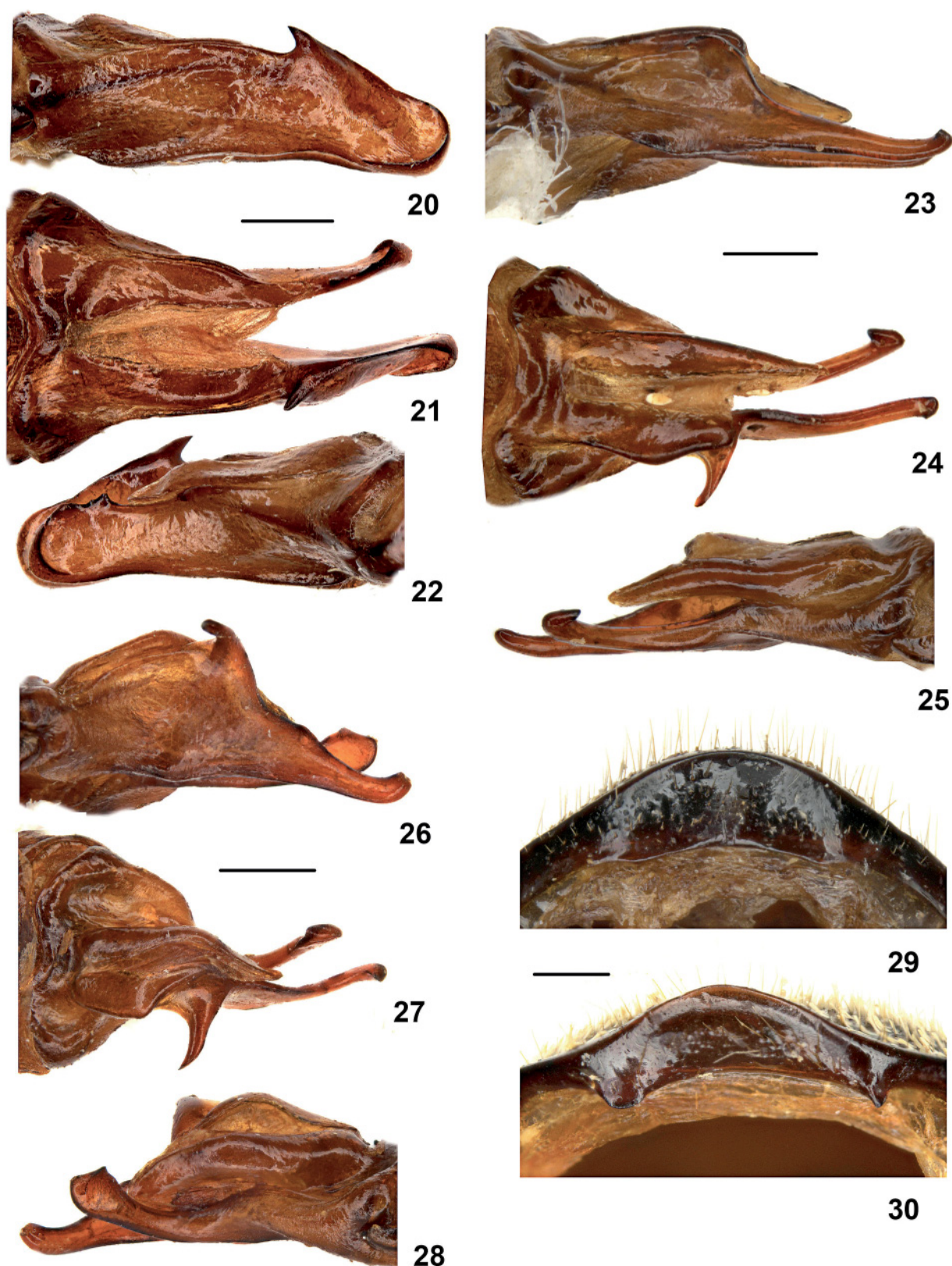
Remarks: *Cyphochilus keithi* n. sp. is morphologically similar to *C. nguyendui* n. sp. and *C. phamthinhae* n. sp. from which it can be easily distinguished by the parameres morphology which is very distinctive for each species (Figs 20-28).

Cyphochilus nguyendui Sabatinelli & Phạm n. sp.

Figs 23-25, 29, 32

Holotype: IEBR; ♂: VIETNAM, Lào Cai Province // NW Vietnam Sapa [Sa Pa] / Hoàng Liên Sơn / near Lao Kay [Lào Cai] (P) // Holotypus ♂ / *Cyphochilus nguyendui* n. sp. / G. Sabatinelli & P. Phạm des. (T on red) //.

Paratypes: 150 specimens. VIETNAM: Lào Cai Province: MHNG (MHNG-ENTO-85544, 85545): 3 ♂, 2 ♀; same data as holotype. – IEBR: 7 ♂; Sa Pa, Hoàng Liên National Park; 19.VI.2002; Hoang Vu Tru leg. – PCAR: 2 ♂; same locality as previous, 22°22.780'N 103°47.640'E, 2050 m; A. Weigel leg. – IEBR: 1 ♂;



Figs 20-30. Paramera in right (apex to the right), dorsal (apex to the right) and left (apex to the left) view: (20-22) *Cyphochilus keithi* n. sp., holotype; (23-25) *C. nguyendui* n. sp., holotype; (26-28) *C. phamthinhae* n. sp., holotype. Ventral portion of pygidium: (29) *C. nguyendui* n. sp.; (30) *C. phamthinhae* n. sp. Scale bars = 0.5 mm.

same locality as previous; 17.V.2003, 1800 m; Hoang Vu Tru leg. – IEBR: 1 ♂; same locality as previous; Cát Cát Village, 1300 m; 16.V.2003; Hoang Vu Tru leg. – IEBR: 1 ♂; same locality as previous; 1830 m; 5.V.2013; Hoang Vu Tru leg. – PCMN: 1 ♂; same locality as previous; 12.V.1990; P. Pacholátko leg. – NHMB: 3 ♂; same locality as previous; 11-15.V.1990; V. Kubán leg. – PCAR: 2 ♂; Hoàng Liên National Park, Sa Pa pass, 1900 m; 27.V.-2.VI.2011; L. Bartolozzi leg. – PCMN: 1 ♂; Sa Pa, 22°20'N 103°50'E; 25.V.-10.VI.1991; E. Jendek leg. – HNHN: 13 ♂, 6 ♀; Hoàng Liên NP, Trạm Tôn, forest edge at light, 22.34937°N 103.77045°E, 1915 m; 8-11.IV.2010; L. Papp, L. Peregovits, Z. Soltész & G. Lengyel leg. – MHNW: 11 ♂; NW Sa Pa, 200 m SW Trạm Tôn pass, 22°21'40"N 103°46'24"E, ~1900 m; 24.VI.2017; Vietnam Expedition 2017 MHNW CNC, H. Schillhammer, R. Schuh, D. Zimmermann, A. Brunke, H. Douglas leg. – MZUF: 2 ♂; Văn Bàn distr., Văn Bàn Nature Reserve, at light, ~1000 m; 23-26.V.2011; L. Bartolozzi, S. Bambi, F. Fabiano, E. Orbach leg. – MZUF: 6 ♂; Hoàng Liên Nat. Park, ~Sa Pa pass, at light; ~1900 m; 25.V.-2.VI.2011; L. Bartolozzi, S. Bambi, F. Fabiano, E. Orbach leg. – MHNG: 13 ♂, 1 ♀; Sa Pa distr. Hoàng Liên Nat. Park; 1900 m; 27-31.V.2011; E. Orbach leg. – ISNB: 1 ♂; Lao Kai [Lào Cai]; 1920; Vitalis de Salvaza [leg.], M. A. Vuillet. – ISNB: 1 ♂; Chapa [Sa Pa]; 25.V.1916; Vitalis de Salvaza [leg.]; Typus [without any species name] – *Cao Bằng Province*: PCAR: 1 ♂; Vin. Don Nui Pia Oac [Phia Oắc Mountain] Nature Res., 22°23'52"N 105°52'53"E, 900-1350; 15.V.2014; A. Skale leg. – *LAOS: Houaphan Province*: NMPC: 4 ♂, 1 ♀; Ban Saleuï, Phu Phan Mt.; 20°15'N 104°02'E, 1500-2000 m; 26.IV.11.V.2001; J. Bezděk

leg. – NMPC: 1 ♂; Ban Saleuï, 30 km S of Xam-Neua [Sam-Neua]; 20°13'39"N 103°59'33"E, 1500 m; 1-17.V.2004; P. Kresl leg. – NMPC: 1 ♂; Ban Saleuï, Phu Phan; 20°12'-13.5°N 103°59.5'-104°01'E, 1340-1870 m; 15-IV-15.V.2008; local collector. – NMPC: 3 ♂; same locality as previous; 20°13'N 103°59'E, 1300-2000 m; 6-18.IV.2004; J. Bezděk leg. – NHMB: 1 ♂, 4 ♀; NMPC: 9 ♂; Phou Pane Mt. [Phu Phan Mt.]; 20°13'09"N 103°59'54"-104°00'03"E, 1480-1550 m; 1-16.VI.2009; NHM Basel, NMPC Prague, Laos 2009 Expedition, M. Brancucci, M. Geiser, Z. Kraus, D. Hauck and V. Kubán leg. – NMPC: 2 ♂, 3 ♀; IECA: 4 ♂; same locality as previous; 22.IV.-14.V.2008; V. Kubán leg. – PCAR: 2 ♂, 1 ♀; Phu Pan [Phu Phan]; 20°11'N 104°01'E, 1730 m; 10.IV.2004; M. Hasegawa leg. – NMPC: 3 ♂, 2 ♀; Phou Pane Mt. [Phu Phan Mt.]; 20°12.328'N 103°00.621', ~1750 m; 15.V.-3.VI.2007; V. Kubán leg. – PCMN: 1 ♂, 1 ♀; NMPC: 1 ♂; same locality as previous; 20°15'N 104°02'E, 1500-2000 m; 26.IV.-11.V.2001; D. Hauck leg. – IECA: 4 ♂, 3 ♀; same data as previous – ZMHB: 12 ♂, 8 ♀; same locality as previous; 20°12'N 104°01'E, 1300-1900 m; 11.IV.-15.V.2012; C. Holzschuh leg.

Description of the holotype male

Body: Subparallel, BL: 19.7 mm, BW: 7.8 mm, BWX: 10 mm situated at midpoint of elytra; dorsal and ventral integuments black, legs and appendices reddish-brown; dorsal surface with yellowish scales more densely aggregated at the lateral margins and apex of elytra where they are yellowish.

Head: CW/L: 3.2; anterior angles of clypeus largely rounded, anterior margin straight; frons depressed, large, thus eyes relatively small (F/O: 5.1); antennal

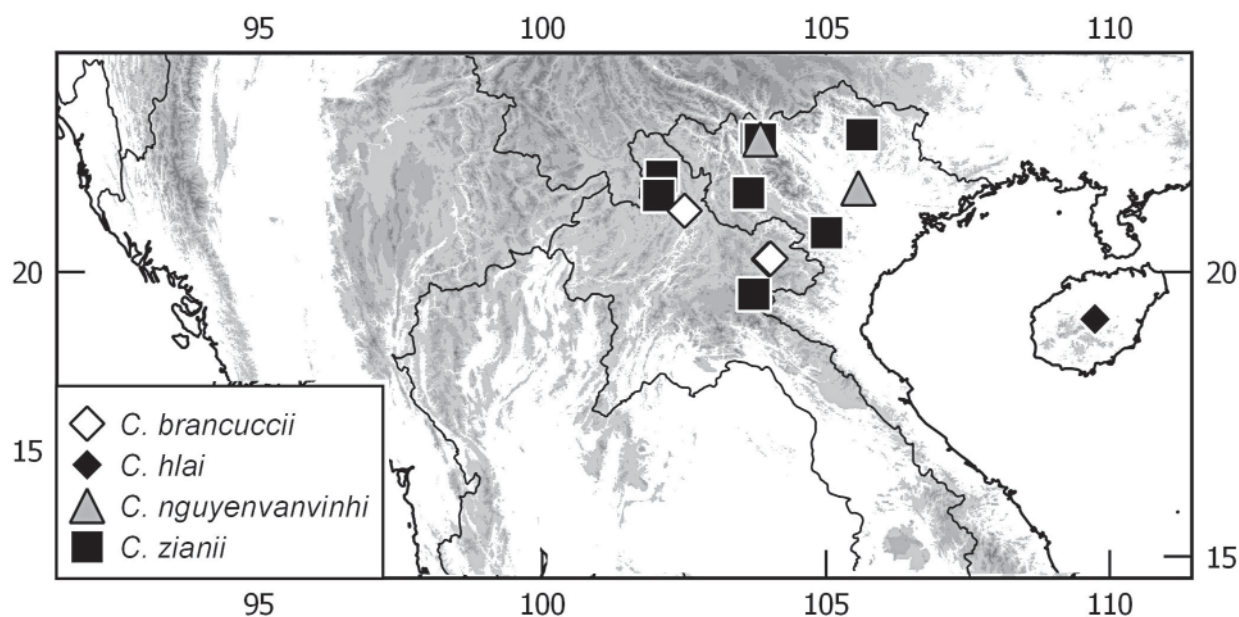


Fig. 31. Geographical distribution of *Cyphochilus brancuccii* n. sp., *C. hlai* n. sp., *C. nguyenanvinhi* n. sp. and *C. zianii* n. sp.

club bent externally twice longer than antennomeres 2-7 (A2-7/CL: 0.4).

Pronotum: Transverse (PnW/L: 2), strongly convex; anterior angles acute, basal obtuse.

Elytra: With four elevated costae, in addition to sutural one, not reaching the elytral apex.

Thoracic sterna: With short, white setation and scales; mesoventrum not developed or visible between the mesocoxae.

Abdomen: Ventrites medially smooth without scales or punctures, last ventrite depressed medially.

Pygidium: Ventral surface narrow.

Legs: Protibiae tridentate with basal teeth small; the two apical teeth close to each other.

Aedeagus: Parameres with median lobe not developed (Fig. 24); right paramere on dorsal margin with a big thorn-like process directed externally (Figs 23-24); left paramere slightly shorter than right narrowed distally (Figs 24-25).

Male paratypes: BL: 18.4-20.6 mm (\bar{x} = 19.8, n = 44). Half of the male specimens have the colour of scale vestiture of the upper part of the body dirty-white instead of yellowish as in the holotype.

Female paratypes: Body ovate larger than males; BL: 19.8-22.1 mm (\bar{x} = 21.8, n = 35); BW: 8.7; BWX: 11.7; antennal club ovate, short (A2-7/CL: 0.9). In the female specimens, the colour of scale vestiture of the upper part of the body is more snow-white than in the males, some specimens also have yellowish scales.

Etymology: Nguyễn Du is a celebrated Vietnamese poet, from the 19th century, called “poet laureate” by

Vietnamese and honoured as “World Cultural Celebrity” by UNESCO in 2013 for his influence in the cultural history of Vietnam and the whole region.

Type locality: Sa Pa or Sapa, is a district-level town of Lào Cai Province in northwest Vietnam, 380 km northwest of Hanoi close to the border with China. The Hoàng Liên Sơn range of mountains dominates the district, which is at the eastern extremity of the Himalayas.

Distribution: *Cyphochilus nguyendui* n. sp. along with *C. brancuccii* n. sp. is one of the most common *Cyphochilus* species collected in North Vietnam (Lào Cai and Cao Bằng Provinces) and Laos (Houaphan Province) (Fig. 32).

Remarks: *Cyphochilus nguyendui* n. sp. is morphologically similar to *C. phamthinhae* n. sp. from which it can be easily distinguished by the morphology of the right paramere, which is much smaller at the base in lateral projection (Figs 23 versus 26). The ventral apical margin of pygidium in *C. phamthinhae* n. sp. is bearing two small pointed apophyses absent in *C. nguyendui* (Figs 30 versus 29).

***Cyphochilus phamthinhae* Sabatinelli & Phạm n. sp.**
Figs 26-28, 30, 32

Holotype: IEBR; ♂; VIETNAM, Vĩnh Phúc Province: // N. Vietnam / Tam Dao [Tam Đảo] / 10-20.V.1993 (P) // Holotypus ♂ / *Cyphochilus* / *phamthinhae* n. sp. / G. Sabatinelli & P. Phạm des. (T on red) //.

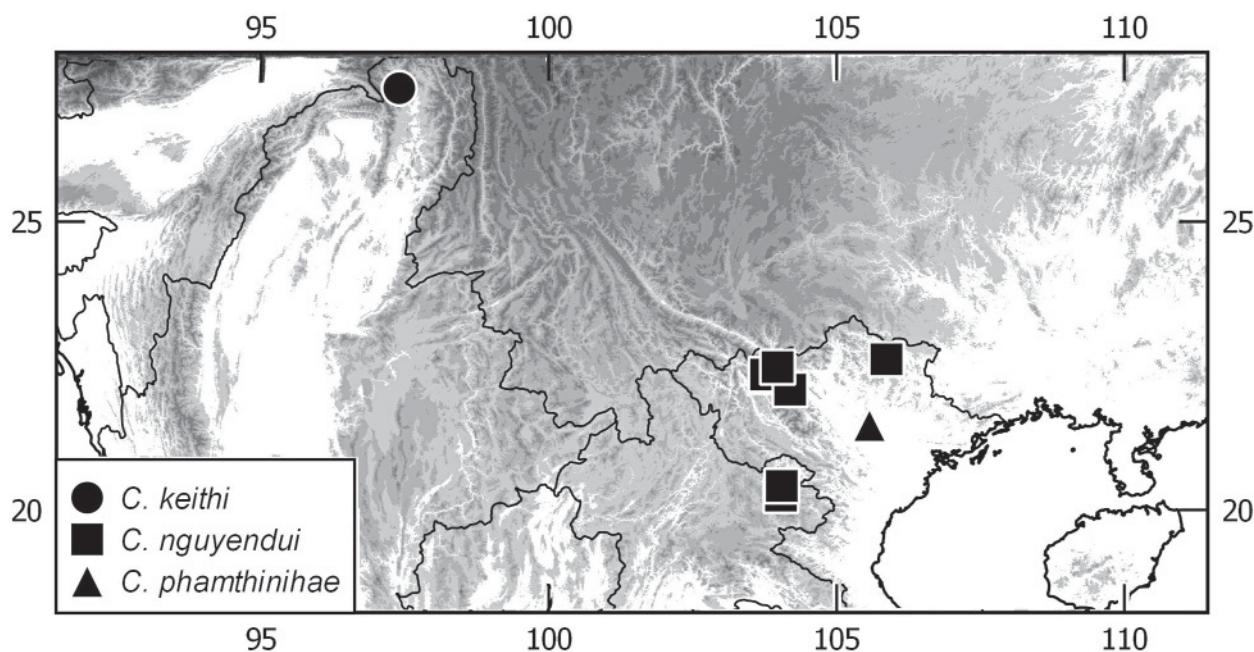


Fig. 32. Geographical distribution of *Cyphochilus keithi* n. sp., *C. nguyendui* n. sp. and *C. phamthinhae* n. sp.

Paratypes: 54 specimens. *VIETNAM: Vĩnh Phúc Province:* IEBR: 7 ♂; Tam Đảo, Tam Đảo National Park; 22-28.V.2004; 1000 m; Hoang Vu Tru leg. – IEBR: 2 ♂; same locality as previous; 2-4.V.2013; Hoang Vu Tru leg. – PCMN: 2 ♂, 1 ♀; ZMHB: 3 ♂; MHNG (MHNG-ENTO-85542, 85543): 2 ♂; Tam Đảo, 75 km from Hanoi; 15.V.-16.VI.1991; E. Jendek leg. – NHMB: 4 ♂; Tam Đảo; 17-21.V-1990; P. Pacholátka leg. – NHMB: 1 ♂, 1 ♀; PCMN: 3 ♂; NMPC: 3 ♂; same locality as previous; 6-9.V-1990; V. Kubán leg. – MHNW: 2 ♂, 1 ♀; NMPC: 1 ♂, 1 ♀; same locality as previous; 25.V.-2.VI.1986; J. Rybníček leg. – NHMB: 2 ♂, 3 ♀; same locality as previous; 20-28.VI.1990, J. Strnad leg. – MHNW: 1 ♂; same locality as previous; 16-23.V.1991; J. Strnad leg. – PCAR: 1 ♂; same locality as previous; 950 m; 1995; local collector. – NHMB: 1 ♂, 1 ♀; same locality as previous; 20-27.VI.1990; A. Olexa leg. – NMPC: 1 ♂; same locality as previous; 900 m; 13-24.V.1989; A. Olexa leg. – MHNG: 1 ♂; same locality as previous; 6-23.V.1990; B. Makovský leg. – NHMB: 2 ♂; NMPC: 1 ♂; same locality as previous; 3-11.VI.1985; J. Picka leg. – NHMB: 1 ♂; same locality as previous; V.1990; J. Picka leg. – NHMB: 1 ♂; same data as previous; Navrátil leg. – NMPC: 3 ♂; same locality as previous but without date; M. Hrasdský leg. – NMPC: 1 ♂; same locality as previous; 900-1400 m; 6-11.VI.1985; J. Jelinek leg.

Description of the holotype male

Body: Subparallel, BL: 19.5 mm, BW: 8.3 mm, BWX: 10.6 mm situated at midpoint of elytra; dorsal and ventral integuments black, legs and appendices reddish-brown; dorsal surface with white scales more densely aggregated at the lateral margins and apex of elytra where they are yellowish.

Head: CW/L: 3; anterior angles of clypeus largely rounded, anterior margin straight; frons depressed, large, thus eyes relatively big (F/O: 3.3); antennal club bent externally longer than antennomeres 2-7 (A2-7/CL: 0.3).

Pronotum: Transverse (PnW/L: 2), strongly convex; anterior angles acute, basal angles obtuse.

Elytra: With four elevated costae, in addition to sutural one, not reaching the elytral apex. **Thoracic sterna:** with short, white setation and scales; mesoventrum not developed or visible between the mesocoxae. **Abdomen:** ventrites medially smooth without scales or punctures, last ventrite depressed medially.

Pygidium: Ventral surface narrow.

Legs: Protibiae tridentate with basal teeth small; the two apical teeth close to each other.

Aedeagus: Parameres with median lobe not developed (Fig. 27); right paramere on dorsal margin with a big thorn-like process directed externally (Figs 26-27); left paramere slightly shorter than right and narrowed distally (Figs 27-28).

Male paratypes: BL: 18.8-20.4 mm ($x = 19.4$, $n = 22$). All specimens have same white scale vestiture of the upper part of the body as in the holotype.

Female paratypes: Body ovate larger than males; BL: 18.2-22.1 mm ($x = 20.8$, $n = 15$); BW: 9; BWX: 11.8; antennal club ovate, shorter than preceding antennomeres 2-7 (A2-7/CL: 1.3). In the female specimens, the colour of scale vestiture of the upper part of the body is more snow-white than in the males.

Etymology: Dr Phạm Thị Nhị is an entomologist and the head of the Department of Insect Systematics at IEBR. She received her doctoral degree from Bonn University, Germany, and for many years has instructed and inspired many young entomologists in Vietnam, including the second author (PP).

Type locality: Tam Đảo. See above the description of *Cyphochilus nguyenvanvinhi* n. sp. for details about Tam Đảo locality.

Distribution: *Cyphochilus phamthinhae* n. sp. is known only from Tam Đảo in the Vĩnh Phúc Province and along with *C. nguyenvanvinhi* n. sp. is another example of endemism of this interesting location (Fig. 32).

Remarks: *Cyphochilus phamthinhae* n. sp. is morphologically similar to *C. nguyendui* n. sp. from which can be easily distinguished by the morphology of the right paramere which is much larger at the base in lateral projection (Figs 26 versus 23). Also the ventral apical margin of pygidium in *C. phamthinhae* n. sp. is bearing two small pointed apophyses absent in *C. nguyendui* (Figs 30 versus 29).

ACKNOWLEDGEMENTS

We would like to thank the following curators of the Museums and Colleagues for the loan of the specimens and for their patience in responding to the requests and delays in returning the material: Aleš Bezděk (IECA), Konjev Desender, Marcel Cludts and Alain Drumont (ISNB), Jiří Hájek (NMPC), Ottó Merkl (HNHM), Olivier Montreuil (MNHN), Milan Nikodým (Prague, Czech Republic), Andreas Reichenbach (Leipzig, Germany), Matthias Seidel (ZMUH), Harald Schillhammer and the late Heinrich Schönmann (NHMW), Manfred Uhlig, Joachim Schulze, Johannes Frisch and Bernd Jaeger (ZMHB), Isabelle Zuercher and Christoph Germann (NHMB). We are grateful to Pham Thi Nhi (IEBR) for her encouragement and facilitation in studying the specimens kindly collected by Hoang Vu Tru (IEBR). We thank Giulio Cuccodoro (MHNG) for his advice on taxonomical issues, Dirk Ahrens for preparing the distribution map, David Carlson, Denis Keith and Stefano Ziani for reviewing the manuscript. This work has been financially supported by IEBR project number DT.6-21.

REFERENCES

- Arrow G. J. 1938. Notes on some Melolonthine Coleoptera from the Malay Peninsula and descriptions of a few new species. *Journal of the Federated Malay States Museums* 18: 267-278.
- Arrow G. J. 1941. Entomological results from the Swedish expedition 1934 to Burma and British India (Coleoptera: Melolonthidae). *Arkiv för Zoologi* 33A(8): 1-8.
- Bezdek A. 2016. Scarabaeidae, subfamily Melolonthinae, tribe Leucopholini (pp. 224-226). In: Löbl I. & Löbl D. (eds), Catalogue of Palaearctic Coleoptera. Volume 3. Scarabaeoidea – Scirtoidea – Dascilloidea – Buprestoidea – Byrrhoidea. Revised and updated edition. *Brill, Leiden-Boston*, 984 pp.
- Brenske E. 1903. Neue Arten der Melolonthiden (Coleopt.) Gattung *Cyphochilus*. *Insekten Börse* 20: 380-381.
- Dalla Torre K. W. von. 1912. Fam. Scarabaeidae, Subfam. Melolonthidae. In: Junk W. & Schenkling S. (eds), Coleopterorum Catalogus. Vol. XX, pars 49. *W. Junk, Berlin*: 450 pp.
- Evenhuis N.L. 2007. The insect and spider collections of the world website. Available at: <http://hbs.bishopmuseum.org/codens/> [Last accessed: 1st December 2019].
- Fairmaire L. 1902. Descriptions de Coléoptères recueillis en Chine par M. de Latouche. *Annales de la Société entomologique de France* 1902: 316-318.
- Frey G. 1971. Neue Ruteliden und Melolonthiden aus Indien und Indochina. *Entomologische Arbeiten aus dem Museum G. Frey* 22: 109-133.
- Krajčik M. 2012. Checklist of the World Scarabaeoidea. *Animamax, supplement 5. Plzen, Czech Republic*, 278 pp.
- Li C. & Yang P. 1999. Revision of the genus *Malaisius* Arrow (Coleoptera: Scarabaeidae: Melolonthinae). *The Canadian Entomologist* 131(2): 187-202.
- Löbl I. & Smetana A. 2006. Distributional Information (pp. 11-15). In: Löbl I. & Smetana A. (eds), Catalogue of Palaearctic Coleoptera. Volume 3. Scarabaeoidea - Scirtoidea - Dascilloidea - Buprestoidea - Byrrhoidea. *Apollo Books, Stenstrup*, [1-6] + 7-690 pp.
- Medvedev S. I. 1951. Platinchatousye (Scarabaeidae), posdem. Melolonthinae, ch. 1 (chrushchi). Fauna SSSR, zhestkokrylye. Tom. 10, vyp. 1. *Moskva, Leningrad: Izd. Akad. Nauk. SSSR* 512 pp.
- Moser J. 1915. Beitrag zur Kenntnis der Melolonthiden (Col.) IV. *Deutsche Entomologische Zeitschrift* 1915: 113-151.
- Nomura S. 1977. On the Melolonthini of Taiwan (Coleoptera, Scarabaeidae). *Tôhō-Gakuhô* 27: 85-109.
- Nonfried A. F. 1893. Beiträge zur Käferfauna von Manipur (Vorderindien). *Berliner entomologische Zeitschrift* 38: 327-340.
- Olivier G.A. 1789. Entomologie, ou Histoire naturelle des insectes, avec leurs caractères génériques et spécifiques, leur description, leur synonymie et leurs figures enluminées. Coléoptères. Tome premier. *Baudoin, Paris*: xx + 497 pp., 65 pls. [genera paginated separately].
- Sabatinelli G. 2020a. Taxonomic notes on the genus *Cyphochilus* Waterhouse 1867 (Coleoptera, Scarabaeoidea, Melolonthinae) with description of 10 new species. *Revue suisse de Zoologie* 127: 157-181.
- Sabatinelli G. 2020b. Taxonomic notes on the genus *Cyphochilus* Waterhouse 1867 (Coleoptera, Scarabaeoidea, Melolonthinae) (part 2) with description of nine new species and a new subspecies. *Munis Entomology & Zoology* 15: 301-318.
- Sabatinelli G. 2020c. Taxonomic notes on the genus *Cyphochilus* Waterhouse 1867 (Coleoptera, Scarabaeoidea, Melolonthinae) (part 3) with description of three new species and a new subspecies. *Acta Societatis Zoologicae Bohemicae* 84: 51-65.
- Sabatinelli G., Pontuale G. 1998. Description of the new genus *Dedaloapterus* and notes on genus *Malaisius* Arrow and *Cyphochilus* Waterhouse. *Lambillionea* 98(1): 60-76.
- Sharp D. 1876. Description of some new species of Scarabaeidae from tropical Asia and Malaisia. Part III (Melolonthini). *Coleopterologische Hefte* 15: 65-90.
- Torre-Bueno J. R., Tulloch G. S., Schuh R. T. 1989. The Torre-Bueno Glossary of Entomology. *New York Entomological Society*: 840 pp.
- Waterhouse C.O. 1867. On some new lamellicorn beetles belonging to the family Melolonthidae. *The Entomologist's Monthly Magazine* 4: 141-146.