



Taxonomic studies on the genera *Echinovelleda* Breuning, 1936 and *Propedicellus* Huang, Huang & Liu, 2020 (Coleoptera, Cerambycidae, Lamiinae, Lamiini)

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Abstract

The genera *Echinovelleda* Breuning, 1936 and *Propedicellus* Huang, Huang & Liu, 2020 are revised. The latter is considered to be a junior synonym of the former based on a comprehensive morphological investigation, especially on the characteristics of male endophallus. Two new species are described from China, viz. *Echinovelleda mumuae* Bi & Mu **sp. nov.** from Yunnan and Guangxi, and *E. protochinensis* Bi & Lin **sp. nov.** from Yunnan and Sichuan. New records are reported for previously described taxa including one new country record of a morphologically similar genus, *Hechinoschema* Thomson, 1857 from China. Illustrations of habitus, endophallic structure, major diagnostic features for all studied taxa, as well as a distributional map are provided.

Key words: China, endophallus, *Hechinoschema*, new species, new synonym, Oriental region

Introduction

The genus *Echinovelleda* was established by Breuning (1936) based on a flightless species (with sharply armed elytra) *E. chinensis* Breuning, 1936 from Sichuan (now Chongqing), China and now contains three species and one subspecies (Bi 2018, Bi & Chen 2021). In the revisional study of *Echinovelleda*, Bi (2018) suggested that the genus is similar to the winged species *Hechinoschema vitalisi* Pic, 1925 from Vietnam based on their armed elytral appearance. Huang *et al.* (2020) proposed a new genus *Propedicellus*, and designated a flying species (with obtusely tuberculate elytra) *Propedicellus guoliangi* Huang, Huang & Liu, 2020 from Yunnan, China as the type species and transferred *Hechinoschema vitalisi* Pic, 1925 to their genus. In that study, Huang *et al.* (2020) distinguished *Propedicellus* from *Echinovelleda* especially by differences in the antennal length, pedicel shape, pronotal maculae, elytral morphology and the development of the hind wings. However, four species with apparently transitional forms, i.e. *Echinovelleda inermis* Bi & Chen 2021 and *E. mumuae* Bi & Mu, **sp. nov.**, with reduced hind wings and obtusely tuberculate elytra, and *E. yanziae* Bi & Chen 2021 and *E. protochinensis* Bi & Lin, **sp. nov.**, with sharply armed elytra and developed hind wings, make the definition of those two genera unsatisfactory.

The present study has been undertaken to clarify the above-mentioned issues. As a result, the genus *Echinovelleda* is revised and redefined. Two new species are described. New synonym and new combinations are proposed. New localities are reported. A distributional map for *Echinovelleda* is provided.

Material and Methods

Material is deposited in the following institutional or private collections (referred to by abbreviations in the text):

CBWX—Collection of Wen-Xuan Bi, Shanghai, China

CCCC—Collection of Chang-Chin Chen, Tianjin, China

CMC—Collection of Chen Mu, Shanghai, China

IZAS—Institute of Zoology, Chinese Academy of Sciences, Beijing, China

KIZ—Kunming Natural History Museum of Zoology, Kunming Institute of Zoology, Chinese Academy of Sciences, Kunming, China

SHEM—Shanghai Entomology Museum, Chinese Academy of Sciences, Shanghai, China

SNUC—Insect Collection of Shanghai Normal University, Shanghai, China

Some photographs of the type specimens of studied species are presented by Bi (2018), Huang *et al.* (2020) and Bi & Chen (2021), and are not repeated herein.

Habitus images were taken using a Canon EOS 60D camera in conjunction with a Canon EF 100mm f/2.8L Macro Lens. Images of the endophallus were produced using the same camera in conjunction with a Canon MP-E 65mm f/2.8 1–5X Macro Lens. Canon MT-24EX Macro Twin Lite Flash was used as light source. CombineZM was used for image stacking. All images were edited and grouped in Adobe Photoshop CS3.

Morphological measurements or proportions are as follows: BL—body length, length from tip of head to elytral apices; BW—body width, equal to the greatest elytral width (EW), exclude the tubercles if exist; EL—elytral length; AL—antennal length.

Abbreviations used for the description of endophallus are as follows: APH—apical phallomere; BPH—basal phallomere; CT—central trunk; MPH—median phallomere; MT—medial tube; PB—preapical bulb; ab—apical bulb; bb—apical bubble; gn—gonopore; ltc—lateral tubercle of central trunk.

Taxonomy

Echinovelleda Breuning, 1936

Echinovelleda Breuning, 1936: 284. Type species: *Echinovelleda chinensis* Breuning, 1936, by original designation.

Propedicellus Huang, Huang & Liu, 2020: 518. Type species: *Propedicellus guoliangi* Huang, Huang & Liu, 2020, by original designation. **Syn. nov.**

Redescription. Body elongate, medium sized (ca. 12.0–21.0 mm long). Head subequal to the pronotal width basally; vertex moderately concave. Eyes coarsely faceted, deeply emarginate; lower lobes vertical. Frons wider than long. Antennal tubercles moderately prominent and separated. Antennae variable in length, AL/BL = 1.5–3.1 in male, 1.3–1.9 in female; at least basal three antennomeres sparsely fringed beneath; scape moderately long, with apical cicatrix developed; pedicel usually projecting on inner side apically; antennomere III the longest. Maxillary and labial palpi with terminal palpomeres fusiform in both sexes.

Pronotum with an inverted trapezoidal shape, subequal to or slightly longer than width basally; with two indistinct transverse grooves at the anterior and posterior margins; anterior middle of each side with a moderately long lateral spine, usually thickened at base and acute apically; disk rough, moderately convex, with three main prominent calli arranged in an inverted triangle. Scutellum moderately long or short, broadly rounded posteriorly.

Elytra longer than twice of pronotal length (relatively longer in female); humeri distinctly broader than pronotal basal width, prominent, broadly rounded or reduced; apices variable in shape. Each elytron conspicuously with series of rounded to conical, irregularly sized tubercles arranged in three longitudinal rows, or partially forming prominent carinae, usually asymmetrical along the suture; disk covered with three types of pubescence forming maculae or patterns, of which one is appressed and usually predominant, another two are inclined (or suberect) and sparse, either dark brown to blackish or yellowish to pale colored, forming small maculae or spots subapically or along the lateral margin. Hind wings normally developed or highly reduced.



FIGURES 1–8. Habitus of *Hechinoschema* sp. and *Echinovelleda* spp. 1, *Hechinoschema spinosum* Thomson, 1857 from Gongshan, Yunnan, China; 2, *Echinovelleda guoliangi* (Huang, Huang & Liu, 2020) from Malipo, Yunnan, China; 3, *E. vitalisi* (Pic, 1925) from Lvchun, Yunnan, China; 4, *E. qiului* (Huang, Huang & Liu, 2020) from Jinxiu, Guangxi, China; 5, *E. yanziae* Bi & Chen, 2021 from Nanling, Guangdong, China; 6, *E. inermis* Bi & Chen, 2021 from Hupingshan, Hunan, China; 7, *E. c. chinensis* Breuning, 1936 from Jinfoshan, Chongqing, China; 8, *E. c. dichromata* Bi, 2018 from Fanjinshan, Guizhou, China. 1, 5, female; 2–4, 6–8, male. 5, holotype from Bi & Chen (2021); 6, paratype from Bi & Chen (2021); 8, paratype from Bi (2018).

Prosternal process narrow, lower than coxae; procoxal cavities closed posteriorly. Mesoventral process variable from distinctly tuberculate to weakly carinate or completely flattened (Figs. 16–18); mesocoxal cavities open externally to mesepimera. Metaventrite moderately long or shortened; metacoxae transverse. Abdominal ventrite I subequal to subsequent three together. Legs long and slender; mesotibiae with a subapical oblique groove externally; first hind tarsal segment slightly shorter than the two succeeding combined; tarsi four segmented; tarsal claws divaricate.

Endophallus of male genitalia in everted condition (Figs. 21–27) S-shaped, moderately long and slender, longer than double length of median lobe; BPH, MPH and APH well defined; crescent-shaped sclerites present. MPH usually subdivided into MT, CT and PB by constrictions, seldom MT and CT merged; MT cylindrical, roughly straight; CT more or less swollen lateroventrally in distal part, with one or two ltc at each side, curved mesially of varying degrees (Figs. 21b, 23b, 24b, 26b); PB moderately long, with developed anterior bulb. APH subdivided into ab and bb; ab conical or truncated conical-shaped; bb highly reduced (Fig. 21a), weakly developed (Fig. 23a) or elongated with developed distal bubble (Fig. 25a). Apical furrow with internal membrane complete, elongated conical-shaped. Ejaculatory ducts paired, gn situated at extreme apex or dorsal side of bb.

Distribution (Map 1). China, Vietnam.

Remarks. The genus *Echinovelleda* was originally established based on a flightless species with sharply armed elytra. Huang *et al.* (2020) described a morphologically similar genus *Propedicellus*, designated a flying species with obtusely tuberculate elytra as its type species and proposed to distinguish their new genus from *Echinovelleda* by “the antennae longer, apex of pedicel processed towards inner side; middle setal band on pronotum short, not extending to apex; elytra covered with a pair of irregular black setal spots at apical 1/3; elytra longer, marginated at apical 1/3 and rounded apically, not covered with large sharp tubercles and the hind wings developed”.

However, as mentioned in Bi & Chen (2021), the shape of antennal pedicel of the two genera is identical and these elytral subapical “black setal spots” also present in both genera. And some other characters employed by Huang *et al.* (2020) such as the length of antennae or elytra (associated with the development of hindwings), or the sharpness of elytral apical margin can be frequently observed to be interspecific morphologically variable within a certain genus, *e.g.* *Pseudoechthistatus* Pic, 1917, *Parechthistatus* Breuning, 1942, *Morimopsis* Thomson, 1857 and *Morimospasma* Ganglbauer, 1890 (Bi & Lin 2016; Takakuwa *et al.* 2020; Bi 2020, 2021), and the shape of the pronotal “setal band” even found to be strongly intraspecific variable (*e.g.* in *E. vitalisi*), therefore can hardly be applied to generic definition.

Moreover, the discoveries of *Echinovelleda inermis* (a flightless species with similar structure of the elytral subapical marginations as those present in *Propedicellus* spp.), *E. yanziae* (simultaneously with elongate elytra, developed hindwings and large sharp elytral tubercles) in Bi & Chen (2021) and two new species with similar transitional situations described below, further make the status of *Propedicellus* unstable.

Finally, the investigation and comparison of male endophallus of above-mentioned species (except for *E. yanziae*) undertaken in this study indicate that all these studied taxa are closely allied. Thereinto, one flightless species (*E. mumuae*) is found closest to a flying species (*E. guoliangi*) regarding the considerable similarities of their endophallic structures, and similar situations also appears between *E. chinensis* and *E. protochinensis*. And no combination of above-mentioned characters can be proposed to separate these involved species into two groups. Therefore, *Propedicellus* Huang, Huang & Liu, 2020 is herein synonymized with *Echinovelleda* Breuning, 1936.

Echinovelleda is similar to the Asian genus *Morimospasma* Ganglbauer, 1889, which also have remarkably elytral tubercles partially arranged in rows or forming carinae, and some taxa of it also have pedicels projecting on inner side apically. These features indicate a close relationship between these two genera. *Echinovelleda* can be distinguished from *Morimospasma* mainly by the elytra with inclined (or suberect) light-colored pubescence forming small maculae or pattern near apices or along the lateral margins, instead of absent, endophallus with PB not extremely elongated and ab conical, not constricted at base, instead of broadened distally or at least cylindrical.

***Echinovelleda chinensis chinensis* Breuning, 1936**

(Figs. 7, 21, Map 1)

Echinovelleda chinensis Breuning, 1936: 284. Type locality: Jinfoshan, Chongqing (=Kin-fu-shan, Szetschuan), China.

Echinovelleda antiquua Gressitt, 1951: 347. Type locality: Suisapa, Hubei, China. Synonymized by Bi, 2018: 270.

Parechthistatus sangzhiensis Hua, 1992 in: Hua *et al.*, 1992: 514. Type locality: Tianpinshan, Sangzhi, Hunan, China.
Synonymized by Bi, 2018: 270.
Echinovelleda chinensis chinensis Bi, 2018: 269; Bi & Chen, 2021: 292.

Material examined. 1 male, Guizhou, Zunyi, Suiyang County, Kuankuoshui N. R., 2010.VI.2–10 (IZAS, IOZ(E)2002924); 1 male, 2 females, China, Guizhou, Liupanshui, Shuichen, Yushe, 1,900–2,300 m, 2022.VI.15–20, leg. Jin-Teng Zhao (CCCC). Other material refers to Bi (2018), Bi & Chen (2021).

Distribution (Map 1). China: Anhui, Hubei, Hunan, Chongqing, Guizhou (new Province record).

Remarks. When Bi (2018) revised the genus *Echinovelleda*, only this species of the genus was considered to be valid. Therein, the APH of male endophallus of *Echinovelleda* was described as “not subdivided”. However, based on an extensive investigation among this species and most subsequently described species undertaken in this study, the APH of this species is reconsidered as “subdivided into ab and bb” for a homological comparison, which with a detailed definition shown in Fig. 21a and is included in the generic description, and that is the same treatment for *E. inermis*.

***Echinovelleda chinensis dichromata* Bi, 2018**

(Fig. 8, Map 1)

Echinovelleda chinensis dichromata Bi, 2018: 270. Type locality: Leigongshan, Guizhou, China.

Distribution (Map 1). China : Hunan, Guizhou.

***Echinovelleda inermis* Bi & Chen, 2021**

(Figs. 6, 22, Map 1)

Echinovelleda inermis Bi & Chen, 2021: 292. Type locality: Hupingshan, Hunan, China.

Distribution (Map 1). China: Hubei, Hunan.

***Echinovelleda yanziae* Bi & Chen, 2021**

(Fig. 5, Map 1)

Echinovelleda yanziae Bi & Chen, 2021: 294. Type locality: Nanling, Guangdong, China.

Distribution (Map 1). China: Guangdong.

***Echinovelleda vitalisi* (Pic, 1925) comb. nov.**

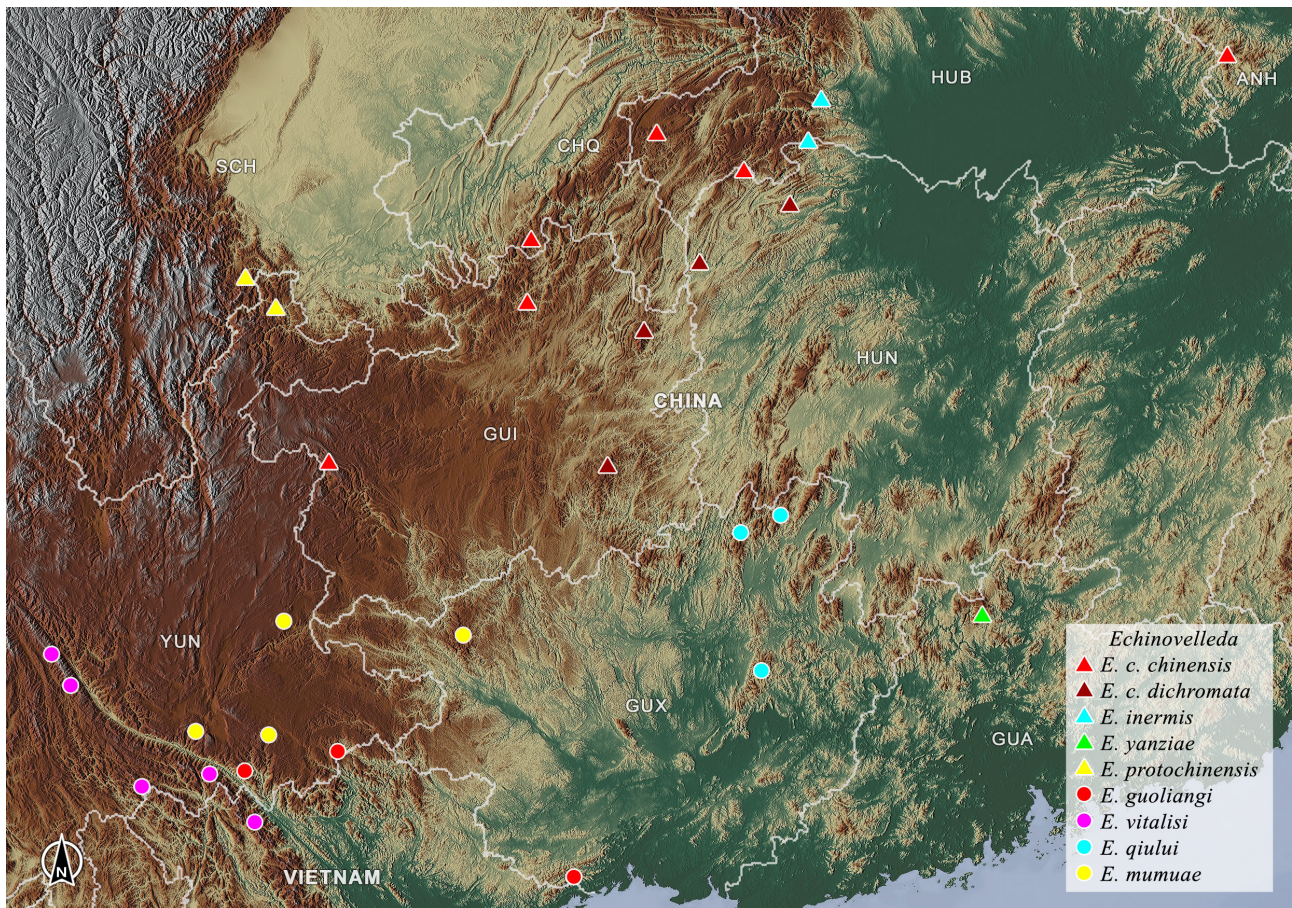
(Figs. 3, 13–16, 26, Map 1)

Trachystola vitalisi Pic, 1925: 17. Type locality: Tonkin, Vietnam.

Eshinoschema tonkinense Breuning, 1938: 188. Type locality: Tonkin, Vietnam. Synonymized by Breuning, 1944: 378.

Propedicellus vitalisi: Huang, Huang & Liu 2020: 522.

Material examined. China (Yunnan): 1 female, China, Yunnan, Zhenyuanxian, Jiujiaxiang, 2,160 m, 2009.VIII.1–3, leg. Ji-Shan Xu & Jian-Xiong Zhang (CCCC); 1 female, China, Yunnan, Zhenyuan, Hepingxiang, Ailaoshan, 2,299 m, 2019.IX.25, leg. Ying-Hui Li (CCCC); 1 male, China, Yunnan, Jinping, Fenshuiling, 2,311 m, 2012.IX.24, leg. Jia-Hong Lin (CCCC); 1 male, China, Yunnan, Lvchun, Huanglianshan, 1,850 m, 2018.VI.17, Leg. Y.-Q. Lu (CCCC); 1 male, ditto except 2,000 m, 2019.VIII.26, leg. Wen-Xuan Bi (CBWX); 1 female, ditto except 1,980 m, 2019.VIII.28, leg. Wen-Xuan Bi (CBWX).



MAP 1. Distribution of *Echinovelleda*.

Complementary description. Male (Fig. 3). External morphology mainly refers to Huang *et al.* (2020). The pronotal discal maculae of light-colored pubescence are partially variable from moderately long stripes to very small spots (Figs.13–16), and elytral discal granules are variable from moderately dense to very sparse.

Endophallus (Fig. 26) smoothly S-shaped, moderately long and slender. MPH subdivided into MT+CT and PB; MT+CT roughly straight, slightly constricted before its midlength, moderately wrinkled on both sides in basal half, provided with two ltc at each side distally, the dorsal ones relatively small (Fig. 26b); PB gently constricted toward moderately developed anterior bulb. APH subdivided into ab and bb; ab conical shaped; bb slender, extremely elongated and distinctly swollen distally, with gn situated at its dorsal side near the base.

Distribution (Map 1). China (new Country record): Yunnan (Zhenyuan County; Jinping County; Lvchun County); Vietnam: Tonkin.

Remarks. This species close to *E. guoliangi* or *E. qiului*, however can be recognized by the elytra with the subbasal bumps relatively higher elevated and the subapical dorsolateral carinae (as “marginated portion” in Huang *et al.* 2020) strongly protruding laterally, partially covering elytral lateral margins in dorsal view. It is also unique among the congeners by the male endophallus provided with two ltc on each side, and bb developed, extremely elongated.

***Echinovelleda guoliangi* (Huang, Huang & Liu, 2020) comb. nov.**

(Figs. 2, 17, 24, Map 1)

Propedicellus guoliangi Huang, Huang & Liu, 2020: 525. Type locality: Pingbian, Yunnan, China.

Material examined. China (Yunnan): 1 male, China, Yunnan, Malipo, Xiajinchang, Laoshan, 1,630 m, 2022.VIII.10, leg. Wen-Xuan Bi (CBWX); 1 female, ditto except 1,700 m, 2022.VIII.8, leg. Wen-Xuan Bi (CBWX); **China (Guangxi):** 1 male, China, Guangxi, Fangchenggang, Naliang, 2020.VI, local collector (CMC).

Complementary description. Male (Fig. 2). Endophallus (Fig. 18, distal part slightly broken) smoothly S-shaped, moderately long and slender; MPH subdivided into MT+CT and PB; MT+CT roughly straight, moderately constricted near its midlength, provided with one ltc at each side distally; PB cylindrical in basal half, with moderately developed anterior bulb; APH subdivided into ab and bb; ab conical shaped; bb weakly developed, provided with a small ventral appendix; gn situated at apex of bb.

Distribution (Map 1). China: Yunnan (Pingbian County; Malipo County), Guangxi (new Province record, Fangchenggang City).

Remarks. Some diagnostic characters employed by Huang *et al.* (2020) to separate this species from *E. vitalisi*, are observed to be intraspecifically variable, such as the shape of pronotal discal maculae, the punctures on head and pronotum and the number of elytral tubercles, or usually applied for a higher classification instead of specific, i.e., the veinal characters (Kukalová-Peck & Lawrence 1993, 2004). Therefore, this species is merely accepted to be distinguished from *E. vitalisi* by the pronotal lateral spines mostly covered with dense light colored pubescence, instead of absent, subapical dorsolateral carinae of elytra (as “marginated portion” in Huang *et al.* 2020) less prominent, not covering elytral lateral margins in dorsal view. It can be further recognized among the congeners (except for *E. mumuae* or *E. yanziae*) by the male endophallus with ab pronounced and provided with a small ventral appendix.

***Echinovelleda qiului* (Huang, Huang & Liu, 2020) comb. nov.**

(Figs.4, 18, 27, Map 1)

Propedicellus qiului Huang, Huang & Liu, 2020: 530. Type locality: Jinxiu, Guangxi, China.

Material examined. China (Guangxi): 19 males, 13 females, China, Guangxi, Jinxiu, Dayaoshan, 1,100–1,600 m, 2015–2021, IV.21–IX.7, local collector (CCCC); 1 male, China, Guangxi, Jinxiu, Shiliugongli, 1,100 m, 2014. VII.17, leg. Yi-Ming Yu (CBWX); 1 female, China, Guangxi, Longsheng, Huaping, 2008, leg. Ye Liu (CCCC); 1 male, China, Guangxi, Xing’an, Maoershan, Antangping, 1,700 m, 2018.VI.22, local collector (CCCC); 1 male, China, Guangxi, Xing’an, Jinshi, 1,200m, 2016.V.11, leg. Yan-Quan Lu (CCCC).

Complementary description. Male (Fig. 4). External morphology mostly refers to Huang *et al.* (2020). The color of integument of flagellomeres are variable from blackish to reddish brown, and the shape of elytral discal granules are variable from rounded to sharply pointed.

Endophallus (Fig. 27) S-shaped, moderately long and slender. Subdivisions of MPH indistinct due to shallow constrictions; MT roughly straight, slightly swollen near its midlength, coarsely wrinkled on both sides; CT strongly curved dorsally at basal half, provided with one small ltc at each side; PB barrel-shaped in basal half, with developed anterior bulb. APH subdivided into ab and bb; ab conical shaped; bb elongated and slender, with gn situated at its apex. Spicules distributed on most part of MPH and ab, except a pair of narrow stripes along dorsolateral sides of CT, those spicules on ab relatively large and sparse.

Distribution (Map 1). China: Guangxi (Jinxiu County; Longsheng County; Xingan County).

Remarks. Based on the comparison of long series of specimens from several localities including sufficient topotypes, most diagnostic characters proposed by Huang *et al.* (2020) to separate this species from *E. guoliangi* are considered to be minor differentiated, or ambiguously defined, or observed to be intraspecifically variable. In addition, the veinal characters being used therein are usually applied for a higher classification (Kukalová-Peck & Lawrence 1993, 2004), or if of specific proposition are usually based on the statistical analysis of sufficient samples, e.g., greater than 50 specimens per species (Rossa *et al.* 2016). The differentiation of vein characters proposed by Huang *et al.* (2020) based on a comparison of only two specimens per species ignores the possibilities of intraspecific variation, therefore is not recommended to be apply to specific diagnosis herein.

Nevertheless, this species is still retained as valid mainly by the combination of its distinctive endophallic structures, i.e., CT strongly curved dorsally, ltc of CT single and very small, PB distinctly swollen in basal half and bb elongated and slender, with gn situated at its apex.

***Echinovelleda protochinensis* Bi & Lin, sp. nov.**

(Figs. 9, 10, 19, 25, Map 1)

Type material. Holotype: male, “CHINA, Yunnan, Zhaotong / Dagan, Sanjiangkou / 1,830 m, 2022.VII.11 em. VII–VIII / leg. J.-T. Zhao & W.-X. Bi” (SNUC).

Paratypes: 1 female, same data as holotype (CBWX); 1 female ditto except “em. X.22” (CBWX); 2 females, same locality as holotype, “1,700–1,850 m / 2022.VI.29, leg. Jin-Teng Zhao” (CCCC); 1 female, ditto except “1,750 m 2022.VI.22 em. XI.13 / leg. J.-T. Zhao (CCCC); 1 male, 4 females, “F1. CHINA, Yunnan, Zhaotong / Dagan, Sanjiangkou / 1,850 m, 2022.VI.29 em. 2023 / IV.20–24, leg. Jin-Teng Zhao” (CBWX); 4 males 4 females, ditto except “em. 2023 / V.30–VI.8” (CCCC); 1 female, same locality as holotype, “1991.VII.2 / 2,000 m, leg. Ning-Nian Xiao” (KIZ); 1 male, “CHINA, Sichuan, Leibo / Xiningzhen, Yangheping / 1,650–1,940 m / 2022.VII.15, leg. Jin-Teng Zhao” (CCCC).

Description. Male (Fig. 9). BL = 14.3–17.3 mm, BW = 4.6–5.7 mm. Integument of body, scape and pedicel blackish; femora and tarsi brown to dark brown, antennomeres III to XI and tibiae reddish brown. Head, pronotum, ventral surfaces and legs mostly covered with light brown to tawny pubescence, intermixed with sparse pale hairs and blackish setae, the pubescence relatively denser ventrally, almost obscuring integument except with three pair of lateral glabrous spots on abdominal ventrite II–IV respectively. Head with yellow to tawny pubescence densely forming five vittae situated between the antennal tubercles, behind the upper eye lobes and behind the genae respectively. Antennae clothed with yellowish pubescence, relatively sparser and thicker on the scape, relatively denser and finer on the extreme apices of antennomeres III to IX. Pronotum with same type of pubescence forming one broad longitudinal stripe across the midline, two narrow stripes beside the middle one on basal half, two board stripes beneath the lateral spines, and forming small spots mainly on the tips of the discal calli or sparsely scattered throughout. Scutellum densely clothed with yellow pubescence except for a narrow glabrous midline. Elytra predominantly covered with light brown pubescence, interspersed with some small yellow pubescent spots mainly behind the scutellum, some yellowish to pale spots or patches scattered along the lateral margins and on apical fourth, and a few blackish velvety maculae near apical fourth.

Head slightly broader than pronotal base; frons sparsely and coarsely punctate; lower eye lobe 1.7 times as long as width, 0.8 times as long as gena. Antennae long, AL/BL = 2.2–3.1; scape rugose, coarsely punctate; antennomere III 1.8 times as long as scape, subequal to IV, V or VI.

Pronotum subequal in length and basal width, the width across lateral spines about 1.6 times of basal width; lateral spine moderately long with acute apex; disk moderately convex, irregularly rugose, sparsely and shallowly punctate, three main calli slightly elevated. Scutellum broadly rounded posteriorly.

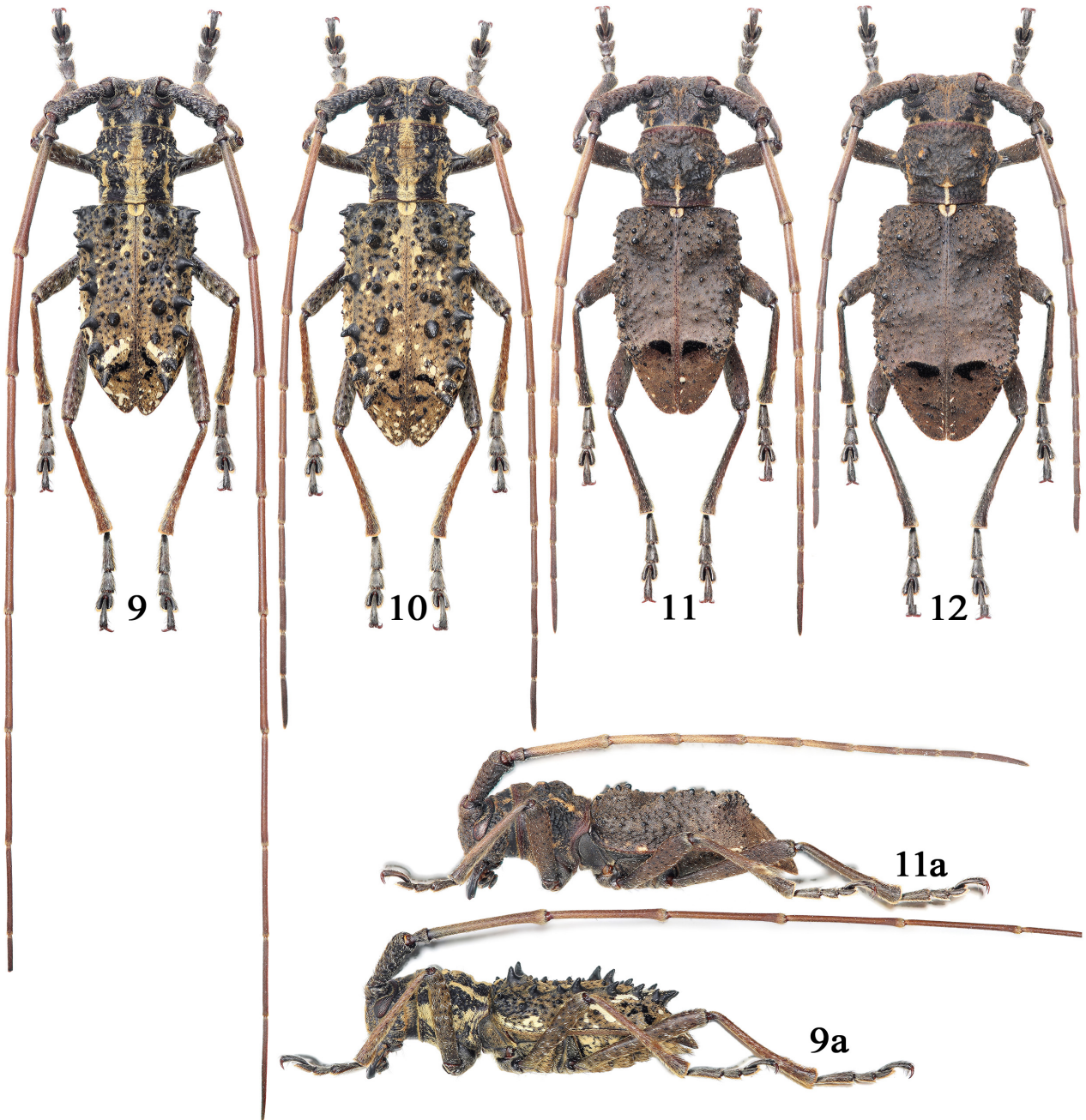
Elytra ca. 1.6 times as wide as pronotal base, EL/EW = 1.8–1.9; subparallel-sided in basal half, then gradually convergent towards separately subacute apices; humeri developed; each elytron conspicuously with series of large, glabrous, mostly conical tubercles forming three longitudinal rows, of which one row is close to the suture extending from elytral base to apical third, composed of 2–5 tubercles, broadly interrupted before its midlength, one lateral row is close to the elytral epipleuron, occupying basal half, consisted of about 5 tubercles, usually relatively small, and one dorsolateral row of 5–7 tubercles is situated between the former two, from behind the humerus to apical one-fifth, with the distal tubercle usually the largest, disk also scattered with a few small granules mainly on basal half and sparsely finely punctate throughout. Hind wings developed, 1.4–1.5 times as long as elytral length. Metaventricle moderately developed, ca. 1.5 times as long as mesoventral length. Legs long, metafemora exceeding elytral apices.

Male genitalia. Tergite VIII, tegmen and median lobe as in Fig. 19. Endophallus (Fig. 25) similar to that of *Echinovelleda chinensis* ssp. (cf. Fig. 21) except for the MT and CT hardly defined from each other due to the comparatively shallower constriction, and APH with bb moderately developed (apical portion elongate and distinctly swollen distally), with gn situated at its dorsal side (Fig. 25a).

Female (Fig. 10). BL = 17.1–19.0 mm, BW = 5.6–6.2 mm. Almost identical to male in general appearance. Body relatively stout. Appendages relatively shorter. AL/BL = 1.8–1.9. EL/EW = 2.0.

Etymology. From the combination of Greek “prōtos”, meaning original, and specific name “*chinensis*”.

Distribution (Map 1). China: Yunnan (Dagan County); Sichuan (Leibo County).



FIGURES 9–12. Habitus of *Echinovelleda* spp. 9, 10, *E. protochinensis* Bi & Lin, **sp. nov.** from Dagan, Yunnan, China; 11, 12, *E. mumuae* Bi & Mu, **sp. nov.** from Shizong, Yunnan, China. 9, 11, male; 10, 12, female. 9, holotype; 10–12 paratype. a, lateral view.

Remarks. The sharply armed elytral appearance of *E. protochinensis* Bi & Lin, **sp. nov.**, *E. yanziae* and *E. chinensis* spp. suggest a possible close relationship of them. This species can be distinguished from *E. yanziae* by the antennomeres III to XI covered with very fine yellowish pubescence not obscuring the integument which giving them a reddish brown appearance (instead of with dense yellowish pubescence completely obscuring the integument), elytron scattered with light-colored pubescent spots (instead of with light-colored pubescence occupying most part of apical two-fifths) and both pronotal lateral spines and elytral main tubercles relatively thicker. The new species can also be separated from *E. chinensis* spp. by the characters associated with the flight capability (e.g. the elongate elytra with developed hind wings or the normally developed metaventrite) and endophallus with ltc relatively slender, basal part of PB relatively longer and APH with bb moderately developed (apical portion elongate and distinctly swollen distally) and gn situated at its dorsal side.

Echinovelleda mumuae Bi & Mu, sp. nov.

(Figs. 11, 12, 20, 23, Map 1)

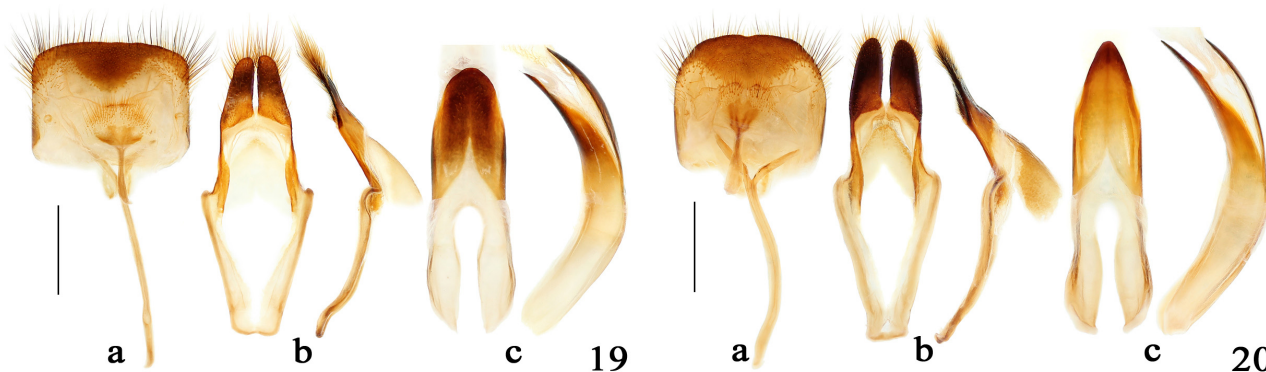
Type material. Holotype: male, “CHINA, Yunnan, Shizong / Junzishan / 2,100–2,400 m, 2022.VII.28–VIII.1 / leg. Wen-Xuan Bi” (IZAS).



FIGURES 13–18. Details of structures of *Echinovelleda* spp. 13–16, *E. vitalisi* (Pic, 1925); 17, *E. guoliangi* (Huang, Huang & Liu, 2020); 18, *E. qiului* (Huang, Huang & Liu, 2020). 13–15, pronotum in dorsal view, show the intraspecific variation of discal maculae; 16–18, mesoventral process in laterofrontal view.

Paratypes: 42 males, 25 females, same data as the holotype (CBWX); 1 female, same data as the holotype (IZAS); 1 male, 1 female, same data as the holotype (SHEM); 3 females, same locality as the holotype, “2022.VII.28 em. VIII.15 / leg. Wen-Xuan Bi” (CBWX); 1 female, ditto except “em. X.9” (CBWX); 10 males, 5 females, ditto except “2022.VII.26–VIII.1 / leg. Jin-Teng Zhao” (CCCC); 1 male, 1 female, same locality as the holotype, “2,142 m, 2023.V.16, leg. Yan-Quan Lu” (CCCC); 1 male, ditto except “2,150 m, 2023.VI.21” (CCCC); 2 males, 4 females, “China, Yunnan, Gejiu / Jiaodingshan / 2,200–2,480 m, 2022.VIII.2–3 / leg. W.-X. Bi & J.-T. Zhao” (CBWX); 2 males, ditto except “2,300–2,490 m, 2022.VIII.2 / leg. Jin-Teng Zhao” (CCCC); 1 male, “China, Yunnan, Gejiu / Shenxianshui / 2,100 m, 2022.VI.30 / local collector (CMC); 2 males, 1 female, “China, Yunnan, Wenshan / Laojunshan / 2,100–2,200 m, 2022.VIII.4 / leg. Jin-Teng Zhao” (CCCC); 1 female, “China, Yunnan, Wenshan / Baozhushan / 2,300 m, 2022.VIII.5 / leg. Wen-Xuan Bi” (CBWX); 1 female, “China, Yunnan, Wenshan / 5km N of Yaodiancun / 2,000 m, 2022.V / local collector” (CMC).

Description. Male (Fig. 11). BL = 12.8–16.1 mm, BW = 4.3–5.7 mm. Integument of body and appendages mostly dark brown, antennomeres III to XI, anterior and posterior margins of pronotum reddish brown. Head, pronotum, ventral surfaces and legs mostly covered with light brown pubescence intermixed with sparse pale hairs and dark brown setae, which are relatively sparser on head and pronotum. Head with three tawny vittae vaguely situated between the antennal tubercles and behind the upper eye lobes. Antennal scape and pedicel clothed with similarly colored pubescence as head, antennomeres III to VIII covered with fine yellowish pubescence, becoming denser on each apex. Pronotum with dense tawny pubescence covered on the tips of discal calli, around the base of lateral spines, and forming two longitudinal stripes situated at sides behind the midlength, which is not reaching posterior margin (these maculae are indistinct or almost absent in some individuals), and with a short narrow median stripe of yellowish pubescence at base. Scutellum densely clothed with yellowish pubescence except for a narrow glabrous midline. Elytra predominantly covered with fine light brown pubescence; each elytron provided with a large transverse velvety macula of blackish pubescence near apical third and a few same colored however much smaller spots behind it, and with a few small yellowish to pale pubescent spots mainly scattered along the lateral margin and on apical third.



FIGURES 19–20. Genitalia of *Echinovelleda* spp. 19, *E. protochinensis* Bi & Lin, **sp. nov.**; 20, *E. mumuae* Bi & Mu, **sp. nov.** a, tergite VIII with sternites VIII & IX in ventral view; b, tegmen in ventral view and lateral view; c, median lobe in ventral view and lateral view. Scale = 1 mm.

Head with frons rugose, coarsely punctate; lower eye lobe 1.7 times as long as width, nearly as tall as gena. Antennae moderately long, AL/BL = 1.5–1.8; scape rugose, coarsely punctate; antennomere III 1.4 times as long as scape, 1.2 times as long as antennomere IV.

Pronotum 1.1 times as long as basal width, the width across lateral spines about 1.6 times of basal width; lateral spine short, thickened at base with subacute apex; disk moderately convex, sparsely and finely punctate, with three main prominent calli arranged in an inverted triangle, and a few setigerous granules converging at sides of the posterior callus. Scutellum rounded triangular.

Elytra ca. 1.7 times as wide as pronotal base, EL/EW = 1.7; slightly widened from humeri to midlength, then gradually convergent toward conjointly rounded apices, moderately convex near basal two-thirds in lateral view; humeri broadly rounded, gently constricted, depressed dorsolaterally; each elytron with series of glabrous, mostly rounded granules (or tubercles) forming one longitudinal row and two carinae, of which one short mesal carina (or represented by a large oval swelling) is about quarter of elytral length situated at base near the scutellum, one lateral (sometimes indistinct) row close to the elytral epipleuron, extending from the humerus to apical two-fifths, and one dorsolateral carina extending behind the humeral depression to apical one-fourth, with posterior edge thickened and prominent, formed by several converging granules; disk also scattered with a few small granules mainly on basal half. Hind wings highly reduced, less than two-fifths of elytral length. Metaventricle shortened, subequal to mesoventral length. Legs moderately long; metafemora roughly reaching elytral apices.

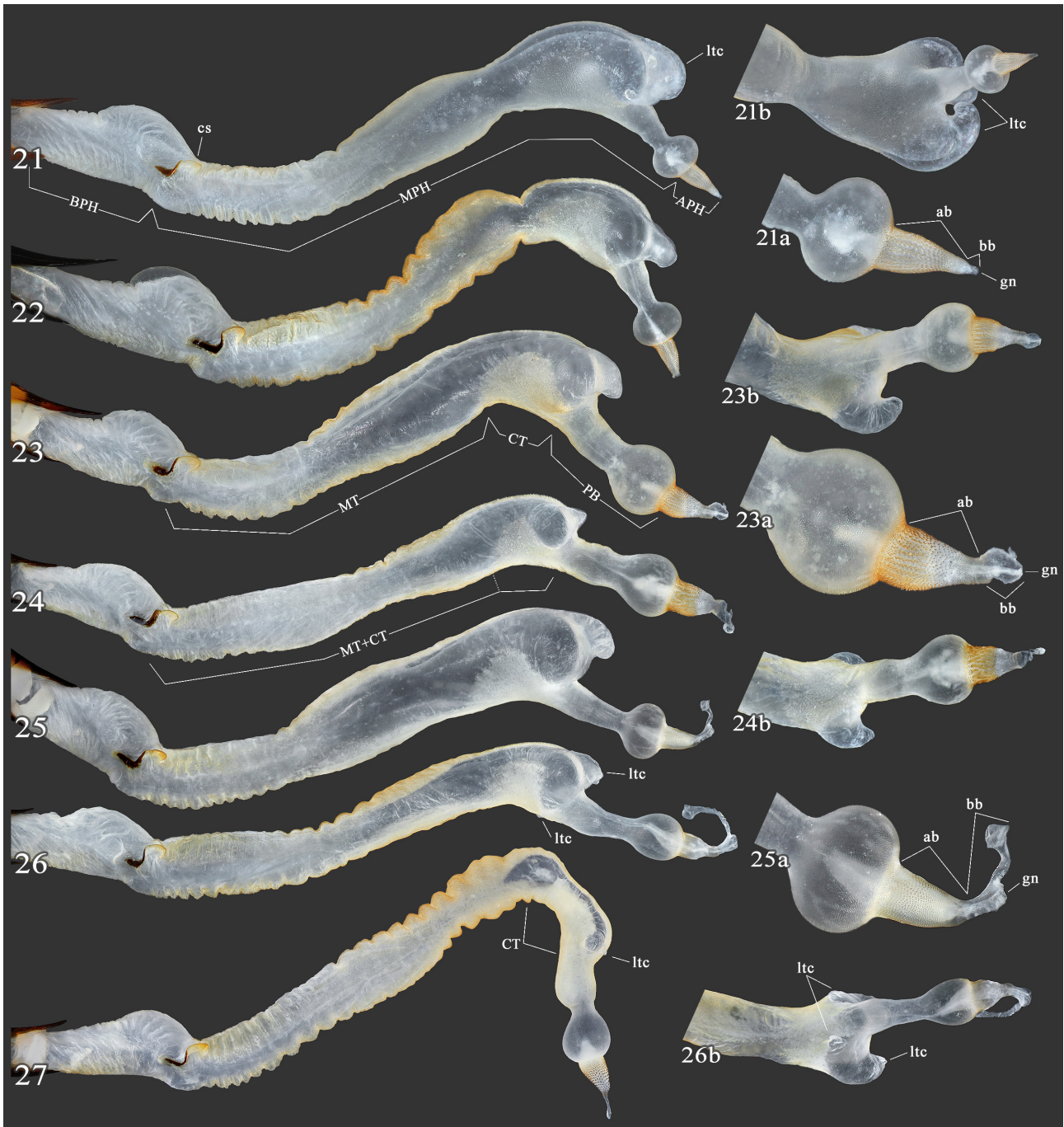
Male genitalia. Tergite VIII, tegmen and median lobe as in Fig. 20. Endophallus (Fig. 23) similar to that of *Echinovelleda guoliangi* (cf. Fig. 24) except for the MT+CT slightly constricted at basal third, MT and CT well defined by a dorsal constriction, CT relatively more curved dorsally and ltc relatively larger.

Female (Fig. 12). BL = 13.3–17.4 mm, BW = 5.1–6.6 mm. Almost identical to male in general appearance. Body relatively stout. Appendages relatively shorter. AL/BL = 1.3. EL/EW = 1.6–1.7.

Etymology. The new species is dedicated to Mu Mu, the daughter of the second author.

Distribution (Map 1). China: Yunnan (Shizong County; Wenshan City; Gejiu City).

Remarks. This new species superficially resembles *E. inermis*, however can be readily separated from it by the pronotum with light colored spots or stripes usually more distinct and well-defined, scutellum relatively lighter colored due to the dense light colored pubescent coverings, elytra markedly bearing a pair of large blackish subapical macula, appendages relatively longer, endophallus with MT not coarsely wrinkled, CT not constricted at ventral side, basal part of PB not constricted distally and bb roughly present. The similarities of the endophallic structures between this species and *E. guoliangi* indicate their close relationship (cf. Figs. 23 and 24). However it can be distinguishable by the external characters which associated with the loss of flight capability, i.e., the moderately constricted humeri, the shortened elytra with reduced hind wings and the shortened metaventricle, also by the comparatively short antennae.



FIGURES 21–27. Endophallus of *Echinovelleda* spp. in inflated and everted condition. 21, *E. c. chinensis* Breuning, 1936; 22, *E. c. dichromata* Bi, 2018; 23, *E. mumuae* Bi & Mu, **sp. nov.**; 24, *E. guoliangi* (Huang, Huang & Liu, 2020); 25, *E. protochinensis* Bi & Lin, **sp. nov.**; 26, *E. vitalisi* (Pic, 1925); 27, *E. qiului* (Huang, Huang & Liu, 2020). a, enlargement of apical portion; b apical portion in dorsolateral view. 21, from Bi (2018); 22, from Bi & Chen (2021).

Hechinoschema Thomson, 1857

Hechinoschema Thomson, 1857: 181. Type species: *Hechinoschema spinosum* Thomson, 1857, by monotypy.

Distribution. Bangladesh, China (new country record), India.

Remarks. This genus currently contains a single species, i.e. *Hechinoschema spinosum* Thomson, 1857. It resembles some species of *Echinovelleda* due to the armed elytral appearance. However it can be recognized by

the pedicel not projecting on inner side, pronotal discal calli highly reduced, almost imperceptible, elytral main tubercles, especially those ones on the sutural rows and middle rows, are almost regular in shape, number and position, and subsymmetrical along the suture (cf. Fig. 1), and elytral pubescent patterns consist of single type of pubescence.

***Hechinoscema spinosum* Thomson, 1857**

(Fig. 1)

Hechinoscema spinosa Thomson, 1857: 182. Type locality: Sylhet.

Monohammus armatus White, 1858: 405. Type locality: Silhet.

Material examined. China (Yunnan): 1 female, 1 female, China, Yunnan, Dulongjiang, Maku, 1,250 m, 2015.VII.21, leg. Chao Wu (CBWX); 1 female, ditto except leg. Wen-Xuan Bi (CBWX); 1 female, ditto except 1,500 m, 2015.VII.22, leg. Xiao-Dong Yang (CCCC); 1 female, ditto except 1,250 m, 2015.VII.25, leg. Wen-Xuan Bi (CBWX).

Distribution. Bangladesh: Sylhet; China (new country record): Yunnan (Gongshan County); India: Assam.

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References

- Bi, W.-X. (2018) Studies on the flightless Lamiinae (Coleoptera: Cerambycidae) from China, II. *Echinovelleda* Breuning, 1936, *Paroriaethus* Breuning, 1936 and *Lonyarbon*, gen. nov. *Japanese Journal of Systematic Entomology*, 24 (2), 267–276.
- Bi, W.-X. (2020) Studies on the flightless Lamiinae (Coleoptera: Cerambycidae) from China, III. Genera *Morimopsis*, *Morimidius* and *Pseudhepomidion* (Morimopsini). *Japanese Journal of Systematic Entomology*, 26 (2), 348–366.
- Bi, W.-X. (2021) Studies on the flightless Lamiinae (Coleoptera: Cerambycidae) from China, IV. Genus *Morimospasma* Ganglbauer, 1890 (Lamiini). *Japanese Journal of Systematic Entomology*, 27 (2), 270–291.
- Bi, W.-X. & Chen, C.-C. (2021) Notes on the Genus *Echinovelleda* Breuning, 1936 with Description of Two New Species from China (Coleoptera: Cerambycidae: Lamiinae, Lamiini). *Japanese Journal of Systematic Entomology*, 27 (2), 292–296.
- Bi, W.-X. & Lin, M.-Y. (2016) A revision of the genus *Pseudoechthistatus* Pic (Coleoptera, Cerambycidae, Lamiinae, Lamiini). *ZooKeys*, 604, 49–85.
<https://doi.org/10.3897/zookeys.604.9049>
- Breuning, S. (1936) Novae species Cerambycidarum V. *Festschrift zum 60. Geburtstag von Prof. Dr. Embrik Strand, Riga*, 1, 274–325.
- Breuning, S. (1938) Novae species Cerambycidarum VI. *Festschrift zum 60. Geburtstag von Professor Dr. Embrik Strand, Riga*, 4, 180–392. [1937]
- Breuning, S. (1944) Études sur les Lamiaires (Coleop. Cerambycidae). Douzième tribu: Agniini Thomson. *Novitates Entomologicae*, 3ème Supplément (107–135), 281–512.
- Gressitt, J.L. (1951) Longicorn beetles of China. *Longicornia*, Paris, 2, 1–667, 22 pls.
- Hua, L.-Z., Li, S.-L. & Zhang, X.-K. (1992) Coleoptera, Cerambycidae. In: Peng, J.-W., Liu, Y.-Q. (Eds.), *Iconography of Forest Insect of Hunan, China*. Hunan Science and Technology Press, Changsha, pp. 467–524.
- Huang, G.-Q., Huang, J.-B. & Liu, Y.-F. (2020) Review of the genus *Hechinoscema* Thomson, 1857 (Coleoptera: Cerambycidae: Lamiinae: Monochamini), with description of a new genus and two new species. *Zootaxa*, 4768 (4), 517–537.
<https://doi.org/10.11646/zootaxa.4768.4.4>

- Kukalová-Peck, J. & Lawrence, J.F. (1993) Evolution of the hind wing in Coleoptera. *Canadian Entomologist*, 125, 181–258.
<https://doi.org/10.4039/Ent125181-2>
- Kukalová-Peck, J. & Lawrence, J.F. (2004) Relationships among coleopteran suborders and major endoneopteran lineages: Evidence from hind wing characters. *European Journal of Entomology*, 101, 95–144.
<https://doi.org/10.14411/eje.2004.018>
- Pic, M. (1925) Nouveautés diverses. *Mélanges Exotico-Entomologiques*, 43, 1–32.
- Rossa, R., Goczał, J. & Tofilski, A. (2016) Within- and between-species variation of wing venation in genus *Monochamus* (Coleoptera: Cerambycidae). *Journal of Insect Science*, 16, 5.
<https://doi.org/10.1093/jisesa/iev153>
- Takakuwa, M., Nakabayashi, H. & Kobayashi, T. (2020) [Japanese *Parechthistatus*]. In: Fujita, H. (Ed.), *Mushi-Sha's Handbook Series of Insects. Vol. 13*. Mushi-sha, Tokyo, pp. 65–78. [in Japanese]
- Thomson, J. (1857) Diagnoses de cérambycides nouveaux ou peu connus de ma collection qui seront décrits prochainement. *Archives Entomologiques, Paris*, 1, 169–194.
- White, A. (1858) Descriptions of *Monohammus Bowringii*, *Batocera Una*, and other Longicorn Coleoptera, apparently as yet unrecorded. *The Proceedings of the Zoological Society of London*, 26, 398–413.
<https://doi.org/10.1111/j.1469-7998.1858.tb06396.x>