

Research article

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Revision of the genera *Pseudotraulia* Laosinchai & Jago, 1980 and *Bannacris* Zheng, 1980 (Orthoptera: Acrididae) with proposal of new synonyms

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Abstract. The genera *Pseudotraulia* Laosinchai & Jago, 1980 and *Bannacris* Zheng, 1980 are revised based on the examination of types and additional materials. *Bannacris punctonotus* Zheng, 1980 is synonymized with *Pseudotraulia cornuata* Laosinchai & Jago, 1980 and *Bannacris* Zheng, 1980 with *Pseudotraulia* Laosinchai & Jago, 1980. The tribal placement of *Pseudotraulia* is discussed and the genus *Pseudotraulia* is transferred here from the tribe Mesambriini of the subfamily Catantopinae Brunner von Wattenwyl, 1893 to the subfamily Coptacrinae Brunner von Wattenwyl, 1893 which is not divided into tribes and consists of 22 genera distributed in the Afrotropical and Oriental regions.

Keywords. *Pseudotraulia*, *Bannacris*, new synonym, phylogenetic position.

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Introduction

Pseudotraulia Laosinchai & Jago, 1980 is a monotypic genus from Thailand with *Pseudotraulia cornuata* Laosinchai & Jago, 1980 as type species. Originally *Pseudotraulia* was placed in the subfamily Catantopinae Brunner von Wattenwyl, 1893 but also compared with the genus *Traulia* Stål, 1873 of the subfamily Eyprepocnemidinae Brunner von Wattenwyl, 1893 (Laosinchai & Jago 1980). Later, Otte (1995) placed it in the tribe Trauliini of the subfamily Catantopinae. Recently it was placed in the tribe Mesambriini of the subfamily Catantopinae (Storozhenko 2018). According to the original description, *Pseudotraulia* is superficially similar to the genus *Traulia* Stål, 1873 which was assigned to the subfamily Eyprepocnemidinae at that time, but differs from it in the shape of the vertex, male cerci and epiphallus (Laosinchai & Jago 1980). In *Traulia*, the interocular distance is broader than the frontal ridge between the antennae; the male cerci erect, bilaterally compressed, dilated near the apex and slightly curved inwards with the apex more or less truncate or slightly excised; the epiphallus is almost divided into two symmetrical parts with ancorae long, hook-shaped and fairly closely spaced, and the ventro-lateral ectophallic plates solid and undivided. In *Pseudotraulia*, however, the interocular distance is narrower; the male cerci elongate, conical with small tooth preapically and the apex acute; the epiphallus is undivided with the ancorae shorter and more widely spaced, and the ventro-lateral ectophallic plates sclerotized and widely divided.

Bannacris Zheng, 1980 is also a monotypic genus from China with *Bannacris punctonotus* Zheng, 1980 as type species. It was not assigned explicitly to a definite family position when established (Zheng 1980), but later considered as a genus of the subfamily Podisminae Jacobson, 1905 (Zheng 1985) and Melanoplinae Scudder, 1896 (Li *et al.* 2006; Mao *et al.* 2011), respectively. Otte (1995) placed it in the subfamily Catantopinae with an uncertain tribal position. According to the original description, *Bannacris* is most similar to the genus *Moessonia* Willemse, 1922, but can be distinguished from the latter by the subglobose eyes, the pronotum not constricted in the middle, the upper medial keel of hind femur smooth and the knee lobes subacute or acute (Zheng 1980).

When types and additional material were examined and compared carefully, it was found that there is no distinct difference between *Pseudotraulia cornuata* and *Bannacris punctonotus*. Consequently, we consider *Bannacris* as a synonym of *Pseudotraulia* and *Bannacris punctonotus* a synonym of *Pseudotraulia cornuata*, respectively, and propose the new synonymies: *Pseudotraulia* Laosinchai & Jago, 1980 = *Bannacris* Zheng, 1980 syn. nov. and *Pseudotraulia cornuata* Laosinchai & Jago, 1980 = *Bannacris punctonotus* Zheng, 1980 syn. nov. The genus *Pseudotraulia* is transferred here from the tribe Mesambriini of the subfamily Catantopinae to the subfamily Coptacrinae Brunner von Wattenwyl, 1893 which is not divided into tribes and consists of 22 genera distributed in the Afrotropical and Oriental regions (Cigliano *et al.* 2022).

Material and methods

This paper is based on the specimens of *Bannacris punctonotus* deposited at the insect collections of Shaanxi Normal University, Central South University of Forestry and Technology, Dali University, China and the types of *Pseudotraulia cornuata* kept in the Department of Agriculture, Bangken, Bangkok, Thailand (DBA). The morphological terminology follows Uvarov (1966) and Storozhenko *et al.* (2015). The terminology of male genitalia follows Dirsh (1956). All photographs were taken using

a Nikon D600 digital camera or Leica DFC 5500 system, and the stacking images were combined using Helicon Focus ver. 6.0.

Institutional abbreviations

CSUFT = Insect Collection, Central South University of Forestry and Technology, Changsha, China (curator: Jianhua Huang)
DAB = Department of Agriculture, Bangken, Bangkok, Thailand (curator: Charuwat Taekul)
DEFA = Department of Entomology, Faculty of Agriculture, Kasetsart University, Bangkok, Thailand
DU = Dali University, Yunnan, China (curator: Benyong Mao)
SNU = Museum of Zoology, Shaanxi Normal University, Xi'an, China (curator: Liliang Lin)

Results

Taxonomy

Class Insecta Linnaeus, 1758
Order Orthoptera Olivier, 1789
Superfamily Acridoidea MacLeay, 1821
Family Acrididae MacLeay, 1821
Subfamily Coptacrinae Brunner von Wattenwyl, 1893

Genus *Pseudotraulia* Laosinchai & Jago, 1980

Pseudotraulia Laosinchai & Jago, 1980: 7 (type species: *Pseudotraulia cornuata* Laosinchai & Jago, 1980, by original designation).

Bannacris Zheng, 1980: 339, 343 (type species: *Bannacris punctonotus* Zheng, 1980, by original designation). **Syn. nov.**

Pseudotraulia – Otte 1995: 261. — Yin *et al.* 1996: 589. — Storozhenko 2018: 56.

Bannacris – Zheng 1985: 180. — Otte 1995: 276. — Yin *et al.* 1996: 90. — Li *et al.* 2006: 211, 669. — Mao *et al.* 2011: 91.

Diagnosis

Head shorter than pronotum. Face in profile slightly reclinate. Fastigium of vertex short, slightly projecting forward. Foveolae absent. Vertex between eyes narrower than frontal ridge between antennae. Eyes large, oval; vertical diameter of eye considerably larger than length of subocular furrow. Frontal ridge distinct, not sulcate. Antennae filiform. Pronotum with low median carina; lateral carinae absent. Prosternal process straight, conical, with sharply pointed apex. Mesosternal lobes broader than long; mesosternal interspace relatively broad; metasternal lobes separated. Tegmina and hind wings well developed. Hind femora moderately slender; dorso-median carina weakly serrated and terminating in a small tooth; ventral genicular lobes of hind knee with angulate apex. Hind tibiae without outer apical spine. Arolium large, reaching apex of claws. Tympanum large, oval. Male 10th tergite with weak furculae on posterior margin; subgenital plate short; cerci elongated, conical with a small tooth near the apex. Female 10th tergite without furculae; subgenital plate elongated with triangularly expanded posterior margin; cerci short, conical; upper valves of ovipositor short, thick with crenulate dorsal keels; lower valves with distinct basal tooth. Male genitalia: epiphallus bridge-like, undivided; ancorae well developed and incurved; oval sclerite present; ectophallic membrane thickened to form two heavily sclerotized pocket-like plates connected with proximal parts of cingular valves and apical valves of penis; basal and apical valves of penis connected by a sharply curved, unbroken flexure.

Remarks

The type species of the genera *Pseudotraulia* and *Bannacris* proves to be the same species. Therefore, *Pseudotraulia* and *Bannacris* form synonymy with each other. The description of *Pseudotraulia* was published on 27 October 1980 whereas the description of *Bannacris* was published on 26 December 1980. Therefore, the latter must be considered as a junior synonym of the former according to Article 23.1 of the Code of Zoological Nomenclature (International Commission on Zoological Nomenclature 1999).

Composition

The genus consists of the only one species distributed in Thailand and South China.

***Pseudotraulia cornuata* Laosinchai & Jago, 1980**

Figs 1–4

Pseudotraulia cornuata Laosinchai & Jago, 1980: 7, figs 1–11 (holotype, ♂, Thailand: Nan Province, experimental station near Nan town; in the Department of Agriculture, Bangken, Bangkok, Thailand).

Bannacris punctonotus Zheng, 1980: 340, 348, figs 21–28 (holotype, ♀, China: Yunnan, Mengla; deposited in the Department of Biology, Shaanxi Normal University, China). **Syn. nov.**

Bannacris punctonotus – Zheng 1985: 180, figs 884–893 (description of ♂). — Zheng 1993: 105, figs 340–342. — Otte 1995: 276. — Yin *et al.* 1996: 90. — Li *et al.* 2006: 212, figs 110, 113. — Mao *et al.* 2011: 91.

Material examined**Holotype**

THAILAND • ♂; lot. 3608, Exp. Stn. Nan; 30–31 Jul. 1972; A. Lewvanich leg.; DAB.

Paratype

THAILAND • 1 ♀; Fang, Chiangmai; 11 Oct. 1975; S. Mongkoltiti leg.; DAB.

Other material

CHINA • 1 ♀, holotype of *Bannacris punctonotus*; Yunnan, Mengla; 10 Aug. 1974; Zhemin Zheng leg.; SNU • 1 ♀; Yunnan, Mengla, Menglun; 28 Aug. 1989; Enbo Ma leg.; SNU • 1 ♀; Yunnan, Menglun, Kongmingshan; 9 Aug. 1990; Enbo Ma leg.; SNU • 1 ♀; Yunnan, Menglun; 31 Aug. 1989; Yuan Huang leg.; SNU • 1 ♀; Yunnan, Menglun, Kongmingshan; 18 Sept. 1990; Guofang Jiang leg.; SNU • 1 ♀; Yunnan, Mengla, Huigang Village; 29 Jul. 2013; Jianhua Huang leg.; CSUFT • 2 ♀♀; Yunnan, Mengla, Yaoqu Twoship; 30 Jul. 2013; Jianhua Huang leg.; CSUFT • 2 ♀♀; Yunnan, Jinghong, Yexianggu, Guanping Six Team; 30 Jul. 2013; Jianhua Huang leg.; CSUFT • 1 ♂; Yunnan, Jinghong, Jinuo; 17 Aug. 1989; Yao Niu leg.; SNU • 1 ♂; Yunnan, Jinghong, Yexianggu; 4 Aug. 2006; alt. 650 m; Benyong Mao leg.; DU.

THAILAND • 1 ♀; Chiang Rai Province; 17 Aug. 2018; Pattarawich Dawwrueng leg.; DEFA • 1 ♀; Nan Province; 25 Aug. 2020; Pattarawich Dawwrueng leg.; DEFA.

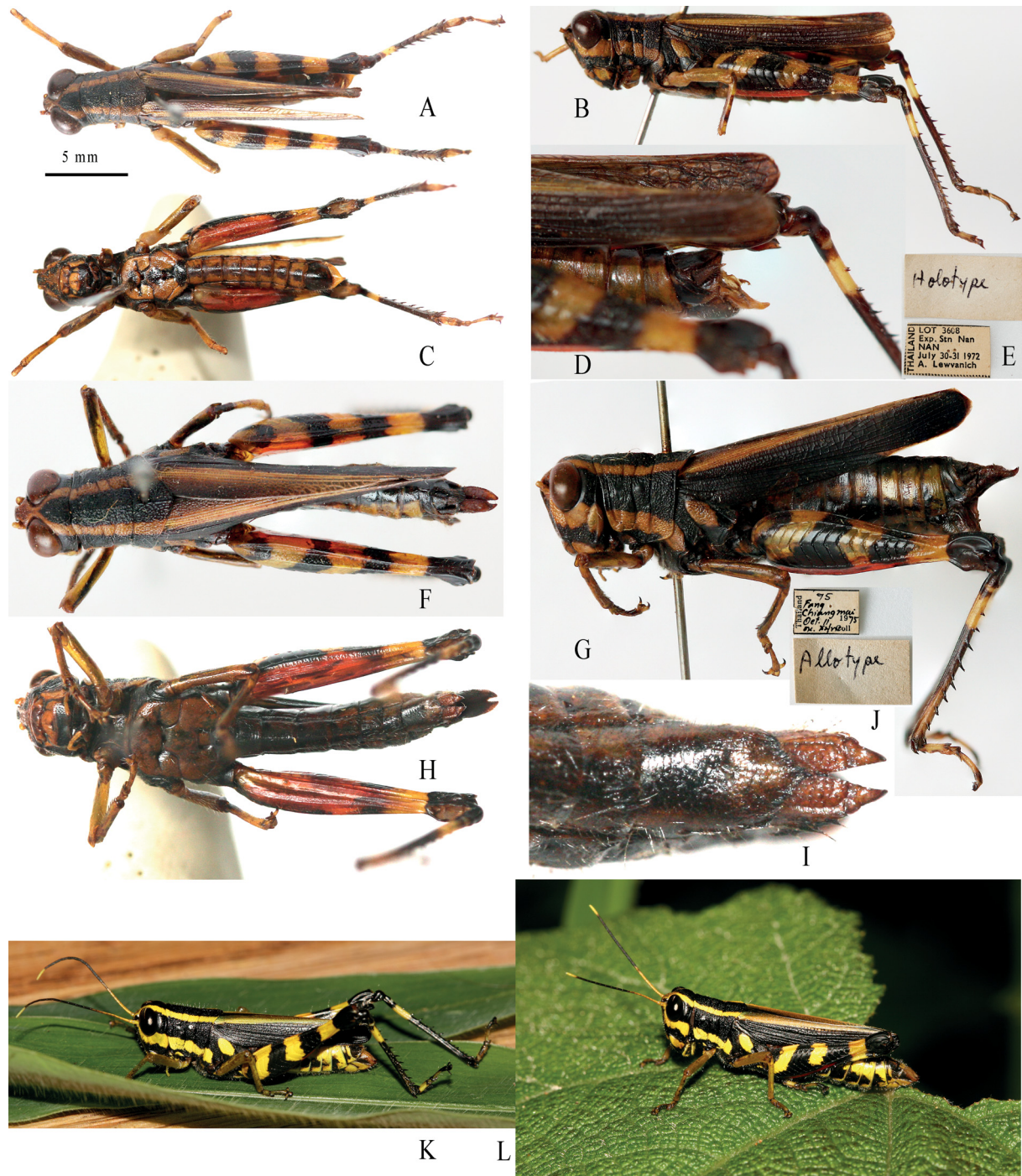


Fig. 1. *Pseudotraulia cornuata* Laosinchai & Jago, 1980. A–E. Holotype (DAB), ♂. A–C. Habitus in dorsal, lateral and ventral views. D. Abdominal apex, lateral view. E. Labels. F–J. Paratype (DAB), ♀. F–H. Habitus in dorsal, lateral and ventral views. I. Abdominal apex, ventral view. J. Labels. K. Living ♀ from Chiang Rai Province, Northern Thailand. L. Living ♀ from Nan Province, Northern Thailand.



Fig. 2. ♀♀ of *Bannacris punctonotus* Zheng, 1980 syn. nov. (= *Pseudotraulia cornuata* Laosinchai & Jago, 1980). A–D. Holotype (SNU), ♀. A–B. Habitus in dorsal and lateral views. C. Inner side of hind leg. D. Labels of the holotype (SNU), ♀. E–N. Closeup of additional materials. E, G–H. Head in frontal view. F. Head and thorax in lateral view. I–J. Meso- and metasterna. K. Outer side of hind femur. L–N. Abdomen in dorsal, lateral and ventral views.

Description

MEASUREMENTS (mm). Length of body: ♂: 18.0–22.2, ♀: 22.0–24.6; length of antennae: ♂: 14.5–14.8, ♀: 12.8–13.1; length of pronotum: ♂: 3.8–4.5, ♀: 4.9–6.3; length of tegmen: ♂: 13.5–15.0, ♀: 16.0–17.5; length of hind femur: ♂: 10.0–11.6, ♀: 13.0–14.0.

Male

BODY. Medium-sized for Coptacrinae.

HEAD. Densely and coarsely punctured or rugose except yellow patch of genae below eyes and black area behind eyes which are smooth and shining; dorsum with or without fine longitudinal sulcus overall length. Face slightly posteriorly oblique in profile view, with oval tubercle below each antennal socket and nearly rectangularly curved sulcus below tubercle; lateral facial keels distinct and nearly straight; frontal ridge straight in lateral view, partially shallowly sulcate below median ocellus or depressed only around median ocellus, lateral sides broadened in arc between antennal sockets and nearly parallel elsewhere or slightly constricted below median ocellus. Clypeus transverse rectangular, broadly longitudinally depressed at anterior $\frac{2}{3}$ near both sides, with lateral margins bisinuate. Labrum subsquare with broad deep W-shaped sulcus, anterolateral angles broadly rounded, and anterior margin broadly concave at middle portion. Eyes large and oval, with longitudinal diameter $1.28\text{--}1.35 \times$ of transversal diameter and $2.22\text{--}2.27 \times$ of subocular sulcus; lower margin of eyes distinctly below median ocellus. Vertex short, roundly connected with frontal ridge; fastigium slightly depressed and rhombic in dorsal view; interocular distance narrower than width of the frontal ridge between antennal sockets and about $0.60\text{--}0.65 \times$ of latter. Antennae filiform and slender, reaching basal third of hind femur, with median segments $3.10\text{--}3.18 \times$ as long as broad.

THORAX. Pronotum cylindrical; lateral margins nearly parallel at prozona and little broadened at metazona; dorsum covered densely with coarse punctures and rugosity; median carina distinct and lateral carina absent; three transverse sulci distinct and all interrupting median carina, and prozona about $1.50\text{--}1.70 \times$ of metazona. Prosternal process conical, with apex bluntly pointed. Lateral lobes of mesosternum pentagonal, with maximum width about $1.16\text{--}1.19 \times$ of length; mesosternal interspace narrow, about $1.17\text{--}1.22 \times$ as long as its minimum width. Lateral lobes of metasternum distinctly separated.

WINGS. Tegmina fully developed, reaching or hardly surpassing apex of hind femora, about $5.20\text{--}5.58 \times$ as long as broad; medial area broad, as broad as costal area, and broader than subcostal and cubital areas; all areas with intercalary veins; hind wing as long as tegmina.

LEGS. Hind femora moderately robust, about $3.96\text{--}4.08 \times$ as long as broad, with upper median carinae extremely weakly serrated and dentate apically (Fig. 2K); both inner and outer lower genicular lobes sharply angulate. Hind tibiae with 8 spines each at inner and outer margins; external apical spine absent; hind tarsi with large arolium exceeding $\frac{1}{2}$ of claws. Tympanum developed, with oval aperture. Tergite of 10th abdominal segment split in middle, with pair of small furculae. Supra-anal plate long pentagonal, mid part longitudinally convex and sulcate overall length, with sulcus broad and deep at basal half and narrow and shallow at apical half; lateral margins sinuate, with basal $\frac{2}{3}$ roundly convex and tapered at apical third; posterior margin blunt-angularly protruding.

GENITALIA. Cerci elongate and conical, with apex curved downwards in lateral view, and short tooth at inner side near apex in dorsal view. Subgenital plate elongate conical, apex distinctly constricted and little pointed. Epiphallus bridge-shaped, not divided into two symmetrical halves; bridge narrow, lophi large, nearly square, and vertically projecting upwards; ancorae large and elongate, curved to ventral and inner sides; anterior projections indistinct and lateral plates concave in middle portion; phallic complex with valves of cingulum longer than apical valves of penis in lateral view and fused apically, and apical

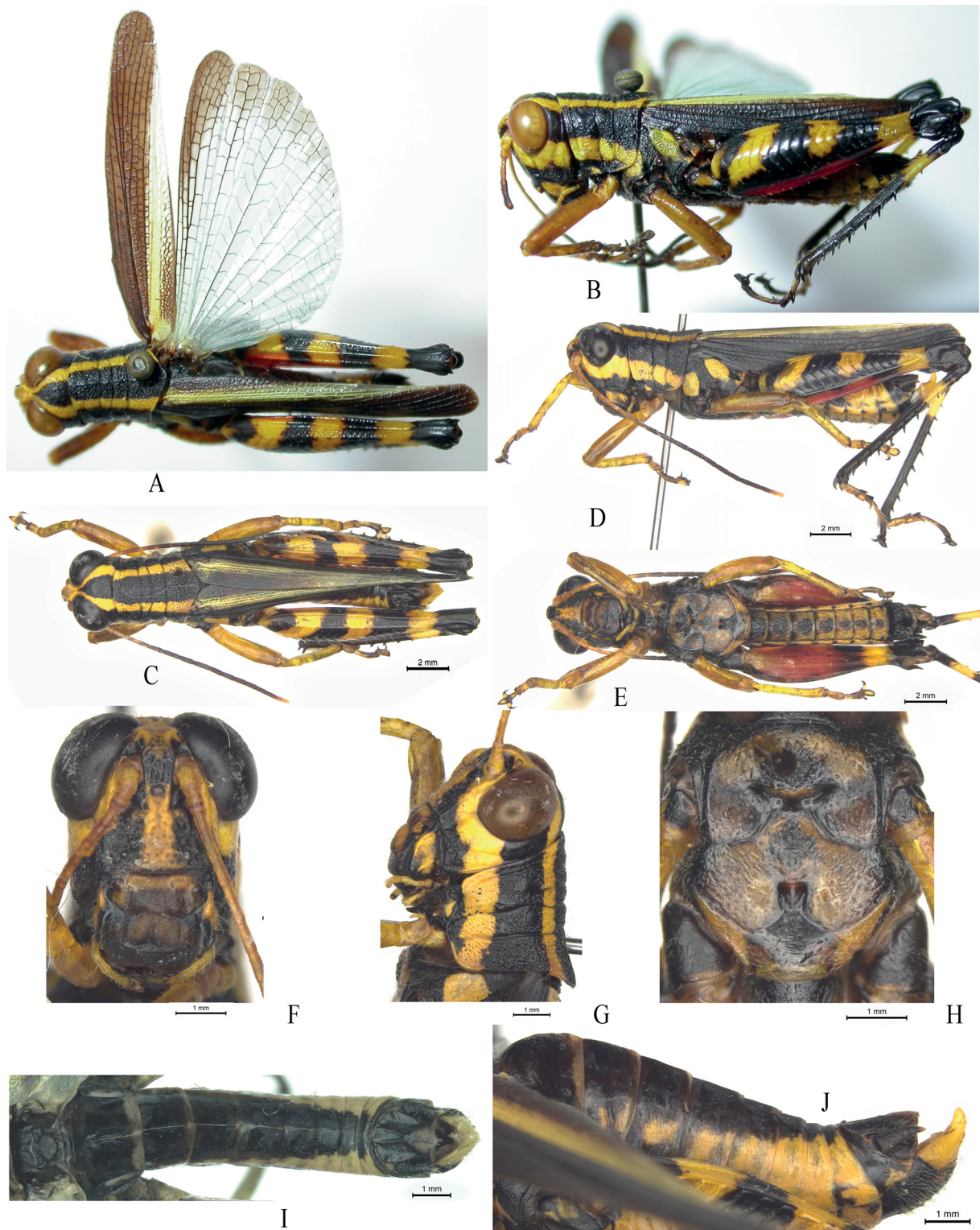


Fig. 3. *Bannacris punctonotus* Zheng, 1980 syn. nov. (= *Pseudotraulia cornuata* Laosinchai & Jago, 1980). A–B. ♂ (SNU) from Yunnan, Jinghong, Jinuo, habitus in dorsal and lateral views. C–J. ♂ (DU) from Yunnan, Jinghong, Yexianggu. C–E. Habitus of in dorsal, lateral and ventral views. F. Head in frontal view. G. Head and thorax in lateral view. H. Meso- and metasterna in ventral view. I–J. Abdomen in dorsal and lateral views.

valves of penis invisible in dorsal view; cingular apodeme and zygoma very narrow; ectophallus bearing at ventral surface additional pair of cystiform sclerites.

COLOR. Mostly black, with four broad longitudinal strips of bright yellow color, one pair extending from dorsum of head inside eyes through lateral sides of pronotum to cubital area of tegmina (Fig. 1A), and another pair extending from genae below eyes to anterior half of mesopleurite (Fig. 1B). Mandibles black apically and yellow basally; labrum with central and posterolateral areas yellowish brown and remaining portion dark brown (Fig. 1C), or completely dark brown (Fig. 3F); clypeus and frons mostly yellow but black at frontal ridge above median ocellus and at both sides of frontal ridge below median ocellus (Fig. 1C), or in some individuals mostly black with frontal ridge yellow below median ocellus (Fig. 3F); tubercles below eyes black; fastigium brown or yellow. Antennae yellow at basal third and apical four or five segments and other antennomeres black. Prosternum and prosternal process black, meso- and metaepisternum each with yellow large maculation (Figs 1B, 3B, 3D); meso- and metasterna mostly yellow brown with some black irregular patches, especially at middle of meso- and metasternum as well as middle of metasternal interspace and first abdominal ventrite (Fig. 3H); inner margins of lateral lobes of mesosternum black. Hind wings infumated at the anterior and external margin and remaining part pale blue. Fore and middle legs yellow; hind femur yellow at upper and outer surfaces with three large black transverse bands which converge together at lower part of outer surface, basal $\frac{4}{5}$ of ventral surface and basal $\frac{3}{5}$ of inner surface red, apical $\frac{1}{5}$ of both lower and inner surfaces yellow, and $\frac{4}{5}$ of inner surface black; knee black. Hind tibiae black with broad yellow ring near base. Hind tarsi yellow but black at dorsal sides. Abdomen mostly yellow, with dorsal black area tapering posteriorly (Fig. 3I), and round black spot at each sternite (Figs 1C, 3E). 10th abdominal tergite and supra-anal plate black, cerci mostly black with apices yellow, subgenital plate black at basal half and yellow at apical half.

Female

Similar to male in body shape and coloration. Eyes with longitudinal diameter 1.39–1.43 × of transversal diameter and 1.82–1.90 × of subocular sulcus. Interocular distance about 0.71–0.75 × of width of frontal ridge between the antennal sockets. Antennae reaching basal forth of hind femur, with median segments 3.65–3.68 × as long as broad. Pronotum with only posterior transverse sulcus interrupting median carina, and prozona about 1.34–1.50 × of metazona. Lateral lobes of mesosternum with maximum width about 1.35–1.38 × of length. Mesosternal interspace about 1.17 × as long as its minimum width. Tegmina about 5.09–5.13 × as long as broad. Hind femora about 3.69 × as long as broad. Supra-anal plate triangular, with broad and shallow longitudinal sulcus at basal half and U-shaped carina at the middle. Subgenital plate broad at middle portion and posterior margin protruding triangularly. Ovipositor valves robust, apex hook-like and pointed; dorsal valves armed with few large blunt teeth at external edge of dorsal side. Body color similar to male but with little variation in some individuals (Fig. 2E–2J). Abdomen mostly black to blackish brown with some yellowish patches at lateral sides of tergites (Fig. 2M) and around lateral and posterior margins of 5th to 7th ventrites (Fig. 2N).

Distribution

This species is known from North (Chiang Mai, Nan), East (Khao Yai National Park) and West (Dawna Hill) Thailand (Laosinchai & Jago 1980), and from Yunnan Province of China.

Remarks

According to the original description and after a careful comparison of the types and additional materials of the two species, no distinct difference is found between them and they should be conspecific. Because *Pseudotraulia cornuata* was published earlier and has the priority, *Bannacris punctonotus* is herein considered as a junior synonym of the former.

Discussion

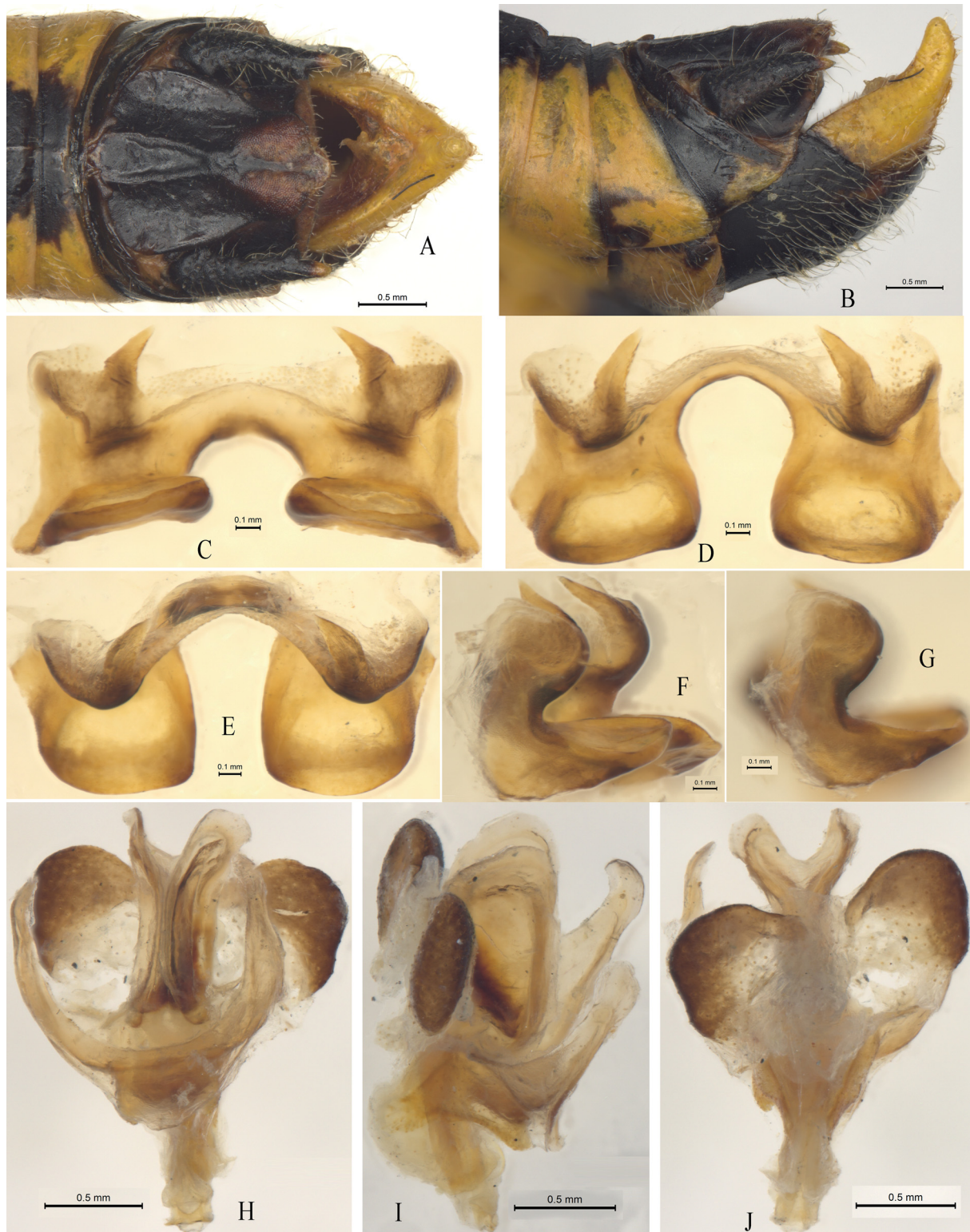


Fig. 4. ♂ (DU) of *Bannacris punctonotus* Zheng, 1980 syn. nov. (= *Pseudotraulia cornuata* Laosinchai & Jago, 1980). **A–B.** Abdominal apex in dorsal and lateral views. **C–G.** Epiphallus in dorsal, dorsofrontal, frontal, dorsolateral and lateral views. **H–J.** Phallic complex in dorsal, lateral and ventral views.

The genus *Pseudotraulia* differs from the members of the tribe Mesambriini of subfamily Catantopinae by the undivided epiphallus and by the lacking of foveolae and pronotal lateral carinae (in Mesambriini, the bridge of epiphallus completely divided, the foveolae long and triangle, and the lateral carinae of pronotum distinct throughout all length or disappear near the middle of pronotum). *Pseudotraulia* is easily recognizable from representatives of subfamily Melanoplinae in the dorso-median carina of hind femora weakly serrated (Fig. 2K) and a sharply curved and the unbroken flexure (in Melanoplinae, the dorso-median carina of hind femora smooth and the flexure between basal and apical valves of penis absent or short and broken). *Pseudotraulia* is similar to the Oriental genera of the subfamily Coptacrinae (*Coptacra* Stål, 1873, *Eucoptacra* Bolívar, 1902, *Apalacris* Walker, 1870 and related genera) in the majority of characters listed in the diagnosis of the genus given above and undoubtedly belongs to this subfamily.

The molecular evidence has been increasingly employed to resolve phylogenetic questions in Orthoptera at different taxonomic scales as well as exploring patterns of molecular and morphological character evolutions (Song *et al.* 2018; Xu *et al.* 2021; Zeng *et al.* 2021). Therefore, a further molecular or even integrated taxonomy study is in need to clarify the phylogenetic position of *Pseudotraulia* with other taxa of Coptacrinae.

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