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## Two new species of *Tetricodes* Fennah, 1956 from Northern Vietnam (Hemiptera: Fulgoromorpha: Issidae)

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Front cover: *Tetricodes tamdaoensis* sp. nov., live specimen in Tam Dao National Park, 1000 m, 25-30.VII.2011 (photograph by J. Constant).

# Two new species of *Tetricodes* Fennah, 1956 from Northern Vietnam (Hemiptera: Fulgoromorpha: Issidae)

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## Abstract

Two new species of *Tetricodes* Fennah, 1956, *T. tamdaoensis* sp. nov. and *T. pacoensis* sp. nov., are described from Northern Vietnam. Illustrations of habitus, male genitalia and live specimen are given along with detailed measurements and a distribution map. The new species are the first of the genus formally recorded from Vietnam. The genus now counts eight valid species distributed over parts of southern China and Northern Vietnam. A checklist of the species of Parahiraciini of Vietnam is provided and counts 7 genera and 11 species.

**Keywords:** Global Taxonomic Initiative, Tonkin, Planthopper, Fulgoroidea, China

## Introduction

The genus *Tetricodes* Fennah, 1956 was described by FENNAH (1956) for a species from China, *T. polyphemus* Fennah, 1956. Six additional species were recently described, also from China (ZHANG & CHEN, 2009; CHEN *et al.*, 2014; GNEZDILOV, 2015; CHANG *et al.*, 2017.). The genus *Tetricodes* belongs to the tribe Parahiraciini Cheng & Wang, 1991 which counts 20 genera distributed in Oriental and south eastern Palaearctic regions (BOURGOIN, 2018; GNEZDILOV, 2017). The tribe Parahiraciini currently contains nine described species in Vietnam (BOURGOIN, 2018), while GNEZDILOV *et al.* (2014) also mention an undescribed species of *Flavina* Stål, 1861 known from a single female and hence wisely left undescribed until a male is available. More undescribed species of Parahiraciini exist in Vietnam, e.g. in the genus *Fortunia* Distant, 1909, which await description (Constant, unpublished data).

Among the Issidae material collected in 2011 in Tam Dao National Park during fieldwork in the frame of the Global Taxonomic Initiative project “A step further in the entomodiversity of Vietnam”, a new species of the genus *Tetricodes* Fennah, 1956 was collected.

GNEZDILOV (2015) mentioned for the first time the presence of the genus in Vietnam. The specimens mentioned by Gnezdilov were also from Tam Dao National Park and belong to the same species we had discovered, and were kindly sent to us for this study. A second species was found in 2002 in Pa Co Nature Reserve in Hoa Binh province by Dr Sergey Belokobylskij (ZIN).

The present paper aims to describe two new species, formally providing the first species record for the genus *Tetricodes* from Vietnam. A key to the species of this genus is left out, since many more species are expected to be found and their identification relies on the examination of the male genitalia characters.

### Material and methods

The specimens were captured by hand using small transparent vials with which they were slowly covered or by sweeping the lower vegetation in the forest.

The genitalia were extracted after heating the abdomen in a 10% solution of potassium hydroxide (KOH) at about 70°C. Some drops of saturated alcoholic Chlorazol black solution were added for contrasting (CARAYON, 1969). The pygofer was separated from the abdomen and the aedeagus dissected with a needle blade for examination under a stereo-microscope. Afterwards, the whole was placed in a tube with glycerine for preservation, which is attached to the pin of the specimen.

The measurements were taken as in CONSTANT (2004) and the following acronyms are used:

BF	=	maximum breadth of the frons
BTg	=	maximum breadth of the tegmen
BV	=	maximum breadth of the vertex
LF	=	length of the frons in median line
LTg	=	maximum length of the tegmen
LT	=	total length (apex of head to apex of tegmina)
LV	=	length of the vertex in median line

Photographs were taken with a Canon EOS 600D camera equipped with a Canon MP-E 65 mm Macro lens, stacked with Zerene Stacker software and optimized with Adobe Photoshop CS3. Observations were done with a Leica MZ8 stereo microscope. The distribution map was produced with SimpleMappr (SHORTHOUSE, 2010).

Acronyms used for the collections.

RBINS	=	Royal Belgian Institute of Natural Sciences, Brussels, Belgium.
VNMN	=	Vietnam National Museum of Nature, Hanoi, Vietnam.
ZIN	=	Russian Academy of Sciences, Zoological Institute, Saint Petersburg, Russia.

### Taxonomy

#### Family Issidae Spinola, 1839

#### Subfamily Issinae Spinola, 1839

#### Tribe Parahiraciini Cheng & Yang, 1991

#### Checklist of the Parahiraciini of Vietnam

- Bardunia curvinaso* Gnezdilov, 2011 [described from Vietnam (GNEZDILOV, 2011)]  
*Brevicopius gorochovi* Gnezdilov, 2017 [described from Vietnam (GNEZDILOV, 2017)]  
*Brevicopius jianfenglingensis* (Chen, Zhang & Chang, 2014) [recorded from Vietnam by GNEZDILOV (2017)]  
*Flavina acuta* Ran & Liang, 2006 [described from Vietnam and Laos (RAN & LIANG, 2006)]  
*Fortunia byrrhoides* (Walker, 1858) [recorded from Vietnam by FENNAH (1978)]

*Fortunia viridis* (Lallemand, 1942) [described from Vietnam by LALLEMAND (1942)]  
*Pseudochoutagus rubens* Gnezdilov & Constant, 2012 [described from Vietnam (GNEZDILOV & CONSTANT, 2012)]  
*Thabena frontocolorata* Gnezdilov, 2015 [described from Vietnam by GNEZDILOV (2015)]  
*Thabena litaoensis* (Yang, 1994) [recorded from Vietnam by GNEZDILOV *et al.* (2014)]

### Genus *Tetricodes* Fennah, 1956

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FLOW: <http://hemiptera-databases.org/flow/?page=explorer&db=flow&lang=en&card=taxon&rank=genus&id=14698>

*Tetricodes* FENNAH, 1956: 513.

Type species: *Tetricodes polyphemus* Fennah, 1956 by original designation.

### Note

For the definition of the genus, we follow CHANG *et al.* (2017).

### Species included

<i>Tetricodes anlongensis</i> Chen, Zhang & Chang, 2014	[China: Guizhou]
<i>Tetricodes ansatus</i> Chang & Chen, 2017	[China: Guangxi]
<i>Tetricodes fennahi</i> Gnezdilov, 2015	[China: Guizhou]
<i>Tetricodes pacoensis</i> sp. nov.	[North Vietnam: Hoa Binh]
<i>Tetricodes parvispinus</i> Chang & Chen, 2017	[China: Guizhou]
<i>Tetricodes polyphemus</i> Fennah, 1956 (type species)	[China: Hubei]
<i>Tetricodes similis</i> Chang & Chen, 2017	[China: Guizhou]
<i>Tetricodes tamdaoensis</i> sp. nov.	[North Vietnam: Vinh Phuc]

### *Tetricodes pacoensis* sp. nov.

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Figs 1–3

ETYMOLOGY. The species epithet derives from Pa Co and refers to the nature reserve where the species was discovered.

### TYPE MATERIAL

Holotype ♂ (Fig. 1 – dissected, right hind wing mounted): Vietnam, Hoa Binh province, Mai Chau, Pa Co 1200m, 27.IV.2002, day collecting, Leg. S. Belokobylskij (ZIN).

DIAGNOSIS. This species is similar to *Tetricodes similis* Chang & Chen (2017), but differs from the latter by larger lateral tooth of capitulum (Fig. 2 A), rounder anal segment in dorsal view (Fig. 2 B), lateral lobe large and strongly projecting (Fig. 2 C) and general shape of aedeagus and phallobase oval in ventral view (Fig. 2 D). The frons is covered with more, paler spots; with light clypeus (Fig. 1 D). It is also close to *T. parvulus* Chang & Chen, 2017 but can be separated from the latter by the ventral half of frons brown (yellow in *T. parvulus*) and the shape of the ventral lobe of the aedeagus more deeply sinuate apically.

### DESCRIPTION.

Measurements and ratios: LT: ♂ (n = 1): 5.7 mm. LTg/BTg = 2.28; LV/BV = 0.47; LF/BF = 1.23.



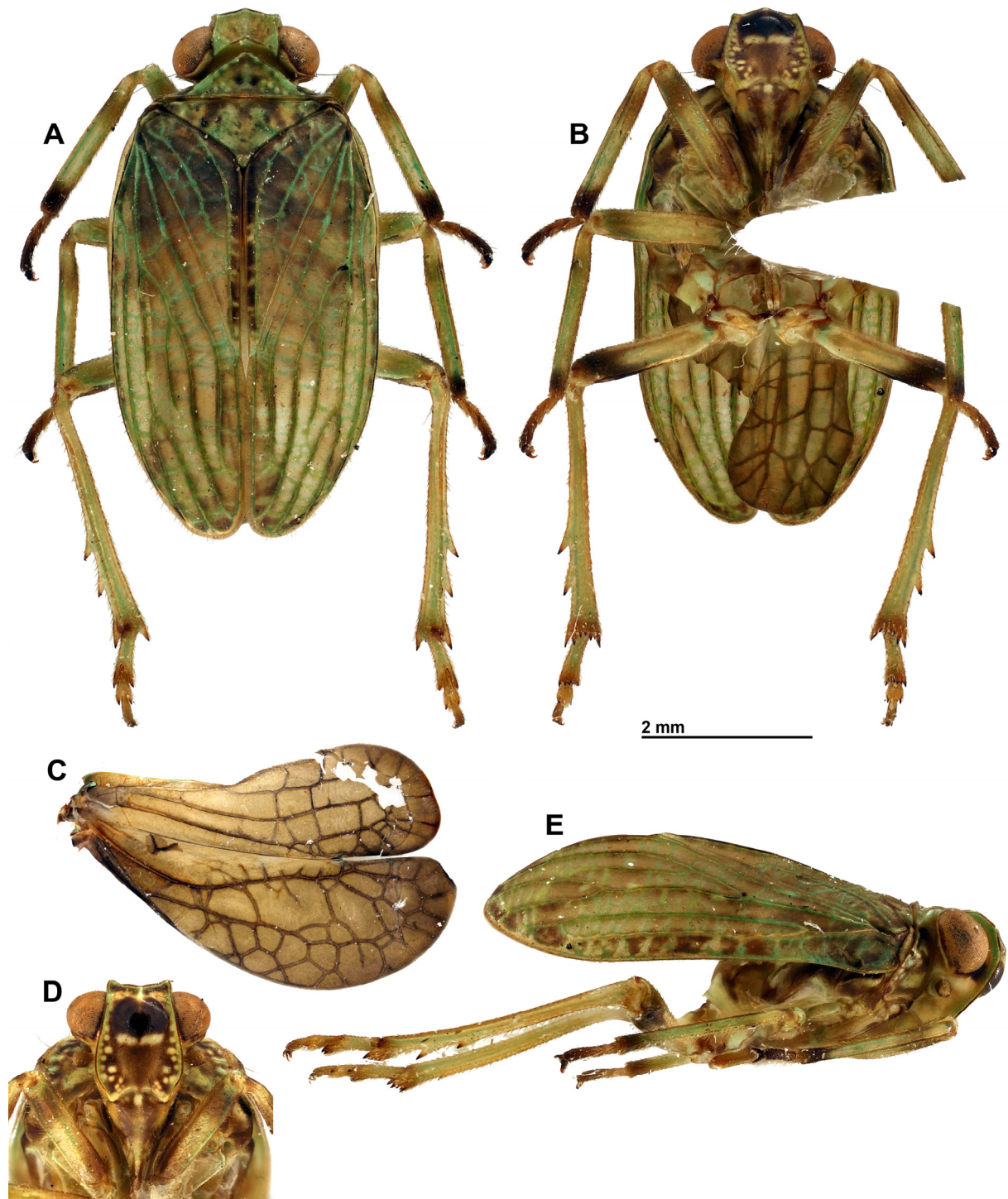


Fig. 1. *Tetricodes pacoensis* sp. nov., holotype ♂, total length: 5.7 mm. A, habitus, dorsal view. B, habitus, ventral view. C, right hind wing. D, frons, normal view. E, habitus, right lateral view.

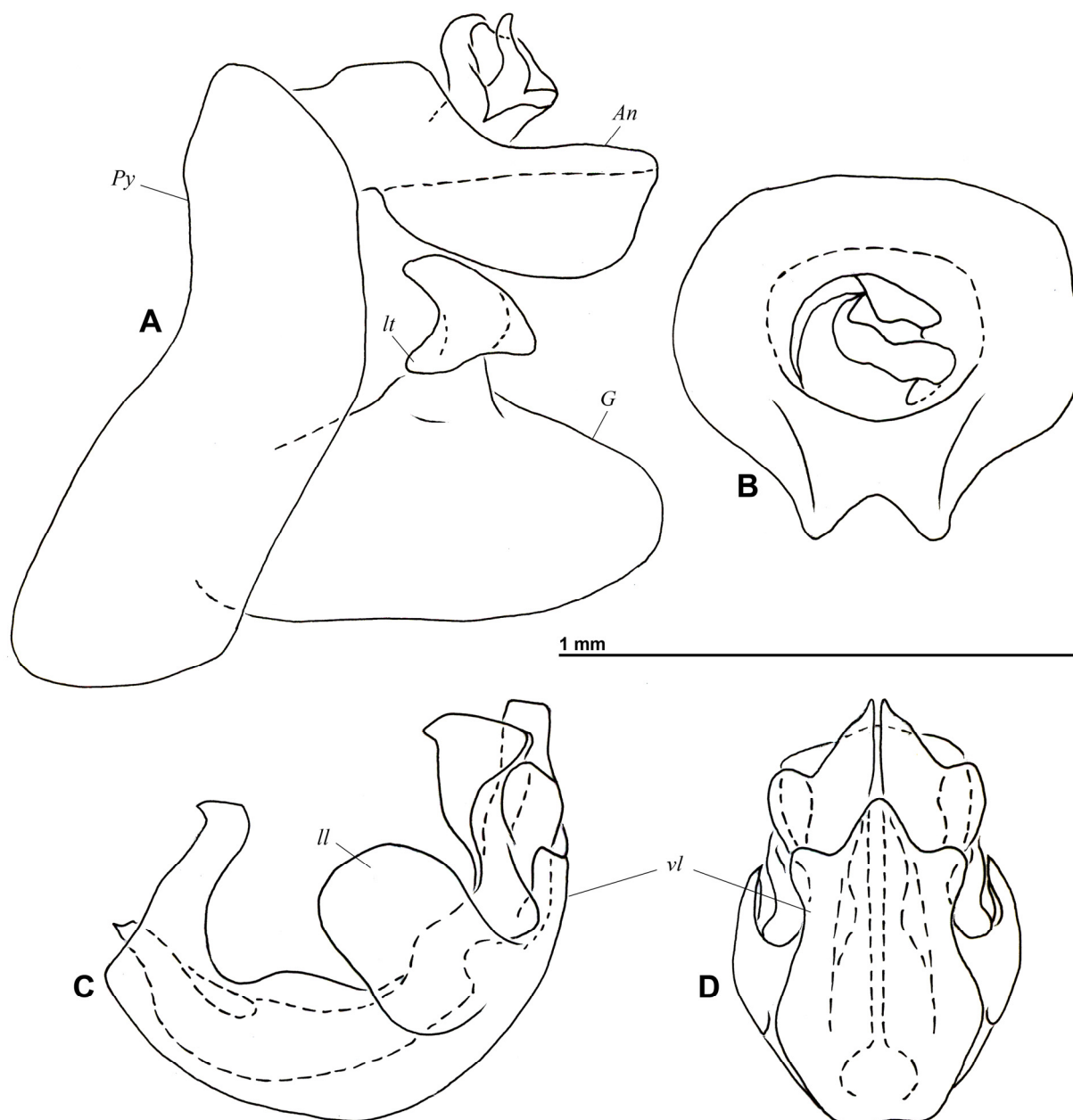


Fig. 2. *Tetricodes pacoensis* sp. nov., holotype, genitalia ♂. A, pygofer, anal tube and gonostylus, lateral view. B, anal tube, dorsal view. C, aedeagus and phallobase, lateral view. D, aedeagus and phallobase, posteroventral view.

An: anal tube; G: gonostyli; ll: lateral lobe; lt: lateral tooth of capitulum; Py: pygofer; vl: ventral lobe. Scale 1mm.

**Head:** (Fig. 1 A–B, D–E) dorsal margin of frons emarginate in middle of normal view; vertex greenish with brown margins in dorsal view, anterior margin convex, posterior margin concave and lateral subparallel. Frons carinated, mostly black with large black protuberance, with light median line running from upper margin, with pale transverse clearer band under black protuberance and above postclypeus, with lighter spots near edges of frons; with lateral carinae roundly merging ventrally. Genae yellow with green towards margins. Clypeus brown with yellowish anteclypeus and yellow spot at margin frons. Labium yellow. Scape short, ring-shaped; pedicel bulbous and dark brown.

**Thorax:** (Fig. 1 A–B, D) green variegated with brown. Pronotum short with disc concave. Mesonotum short but longer than pronotum. Tegulae yellowish brown.

Tegmina: (Fig. 1 A–B, D) elongated, greenish with base and irregular markings in cells brown; veins green; lateral margin slightly bisinuate in dorsal view; apex rounded.

Hind wings: (Fig. 1 C) brown with base paler and veins darker; bilobed; slightly shorter than tegmina. Venation reticulate with main longitudinal veins distinct basally (C, ScP+R, MP, CuA), anal area reduced.

Legs: (Fig. 1 A–B, D) elongate and slender. Pro- and mesofemora variegated greenish brown with yellowish median part. Pro- and mesotibiae variegated brown and greenish; black distally; slightly laminate along external margin, Pro- and mesotarsi brown to black. Metafemora green and yellowish with brown distal marking on ventral face. Metatibiae green and yellowish, brown at base and apex, with two lateral spines on distal half and nine apical spines. Metatarsi mostly greenish dorsally and brown ventrally, basal segment elongate with a strong spine at each side and a row of six smaller spines in between ventrally along posterior margin; second segment with a strong tooth at each side along posterior margin. Metatibiotarsal formula: (2) 9/8/2.

*Genitalia* ♂: pygofer (Fig. 2 A) narrow and curved, higher than broad, narrowing on ventral 1/2 in lateral view, irregular subquadrate. Gonostyli (Fig. 2 A) oval, with large lateral tooth of capitulum on short neck. Anal tube (Fig. 2 B) oval in dorsal view, with two basal lobes, more broad than high. Epiproct (Fig. 2 B) located around basal half of anal tube. Phallobase (Fig. 2 C) with long and narrow process in dorsal margin; lateral process splitting in two branches; with lobe-like protrusion and hook-shaped protrusion in apical part in ventral view (Fig. 2 D). Ventral lobe short with three lobes apically (Fig. 2 C, D). Aedeagus with pair of big lateral lobes, directed dorsally towards long process (Fig. 2 C-D).

**BIOLOGY.** *T. pacoensis* sp. nov. was collected in Pa Co Nature Reserve at the end of June in moist evergreen low mountain forest at an altitude of around 1200 m.



Fig. 3. *Tetricodes tamdaoensis* sp. nov. and *T. pacoensis* sp. nov., distribution map.



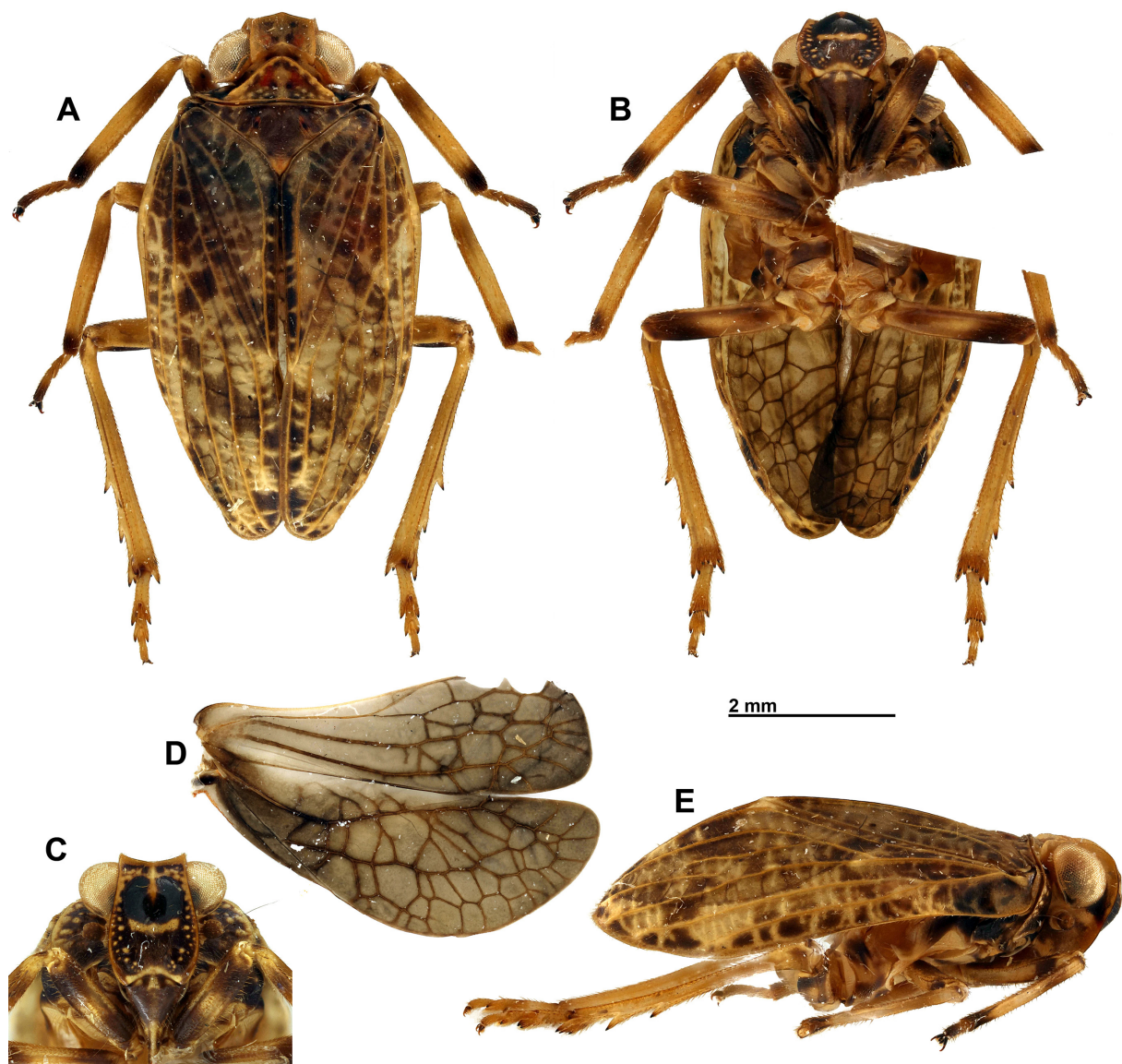


Fig. 4. *Tetricodes tamdaoensis* sp. nov., holotype ♂, total length: 6.5 mm. A, habitus, dorsal view. B, habitus, ventral view. C, frons, normal view. D, right hind wing. E, habitus, right lateral view.

***Tetricodes tamdaoensis* sp. nov.**

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Figs 3–6

ETYMOLOGY. The species epithet derives from Tam Dao and refers to the national park where the species was discovered.

TYPE MATERIAL

Holotype ♂ (Fig. 4 – dissected, right hind wing mounted): Vietnam, Tam Dao N.P., 21°31'N 105°33'E, 25-30.VII.2011, day collecting, leg. J. Constant & J. Bresseel, I.G.: 31.993 (RBINS).

Paratypes: 1♂, 1♀: same data as holotype (♂: VNMN; ♀: RBINS); 2♂♂, 2♀♀: Vietnam, Vinh Phuc Prov. Tam Dao, 100 km NW of Hanoi, 1000m forest, 10.XI.1990 day collecting, leg. S. Belokobylskij (ZIN); 1♂: Vietnam, Vinh Phuc, Tam Dao, 10.XI.1990, A.V. Gorokhov leg. (ZIN).



Fig. 5. *Tetricodes tamdaoensis* sp. nov., live specimen in Tam Dao National Park, 1000 m, 25-30.VII.2011 (photographs by J. Constant).

**DIAGNOSIS.** This species differs from other *Tetricodes* species by the aedeagus having lateral lobes pointing towards the ventral side, folding around the ventral lobe (Fig. 6 C–D) and without long lobe-shaped process (Fig. 6 C).

**NOTE**

The description of the colours is based on photographs of live specimens (Fig. 5).

**DESCRIPTION.**

*Measurements and ratios:* LT: ♂ (n = 4): 6.2 mm; ♀ (n = 1): 6.7 mm. LTg/BTg = 2.31; LV/BV = 0.44; LF/BF = 1.23.

*Head:* (Fig. 4 A–C, E) dorsal margin of frons emarginate in middle in normal view; vertex greenish with brown margins in dorsal view, anterior margin convex, posterior one concave and lateral subparallel. Frons carinated, mostly black with large black protuberance with light median line reaching upper margin; pale transverse clearer band under black protuberance and above postclypeus; lighter spots near lateral margins; lateral carinae roundly merging ventrally. Genae yellow with black spots towards eyes. Clypeus brown with yellowish anteclypeus and yellow spot at margin of frons. Labium yellow. Scape short, ring-shaped; pedicel bulbous, dark brown.

*Thorax:* (Fig. 4 A–B, E) green variegated with brown. Pronotum short with disc concave and yellow median groove. Mesonotum short but longer than pronotum; scutellum yellow. Tegulae brown.

*Tegmina:* (Fig. 4 A–B, E) elongated, green and yellowish with base and irregular markings in cells brown; veins green; lateral margin slightly bisinuate in dorsal view; apex rounded. Whitish irregular oblique line around basal 1/3; whitish spot near apex of clavus; irregular, curved transverse blackish line around 2/3 of length.



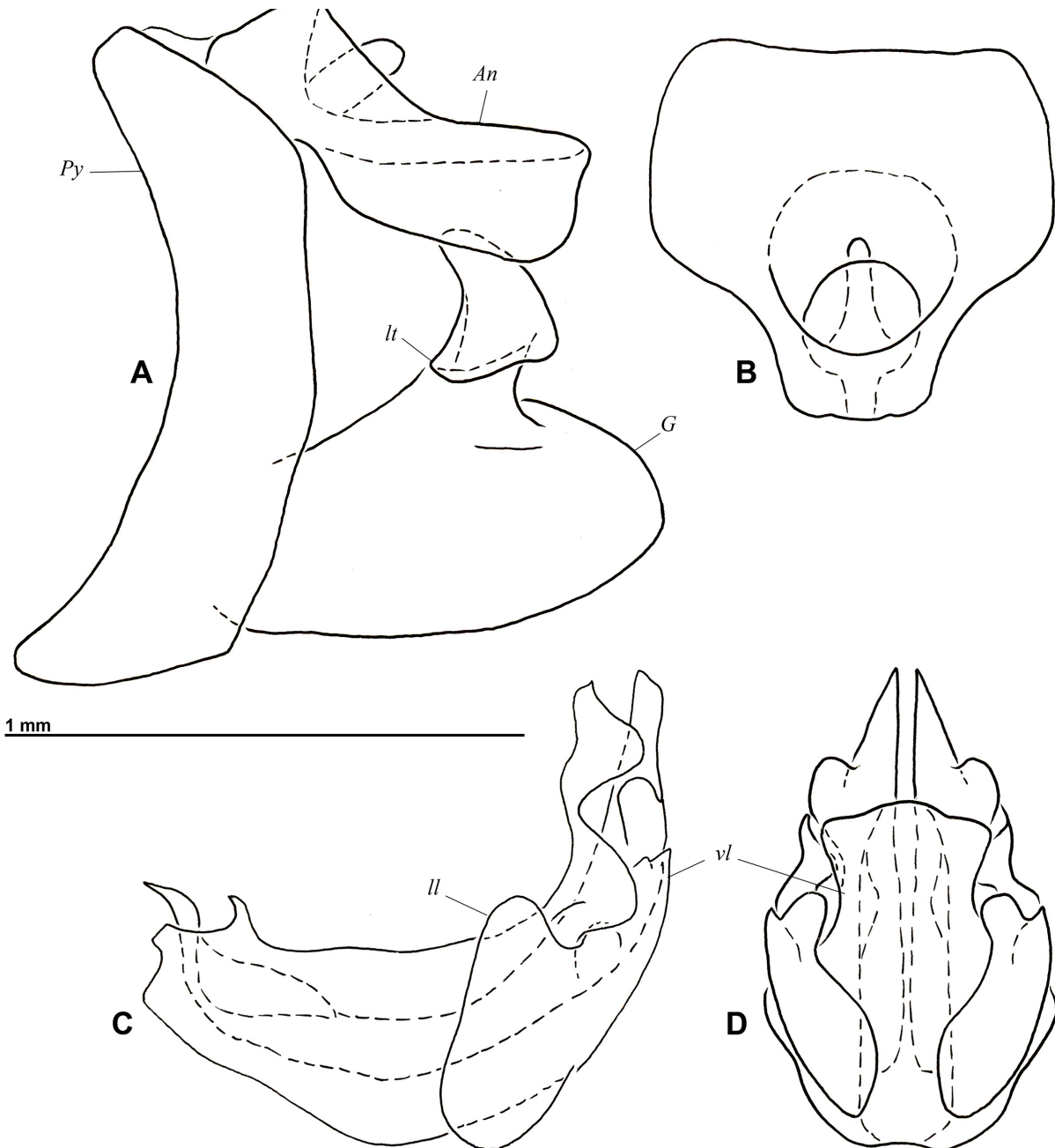


Fig. 6. *Tetricodes tamdaoensis* sp. nov., holotype, genitalia ♂. A, pygofer, anal tube and gonostylus, lateral view. B, anal tube, dorsal view. C, aedeagus and phallobase, lateral view. D, aedeagus and phallobase, posteroventral view.

An: anal tube; G: gonostyli; ll: lateral lobe; lt: lateral tooth of capitulum; Py: pygofer; vl: ventral lobe. Scale 1mm.

Hind wings: (Fig. 4 D) dark brown with base paler and veins darker, bilobed, slightly shorter than tegmina. Venation reticulate with main longitudinal veins distinct basally (C, ScP+R, MP, CuA), anal area reduced.

Legs: (Fig. 4 A–B, E) elongate and slender. Pro- and mesofemora greenish brown with yellowish median part. Pro- and mesotibiae yellowish with subbasal brown ring, black distally, slightly laminate along external margin. Pro- and mesotarsi brown to black. Metafemora yellowish with brown distal marking on ventral face. Metatibiae yellowish, brown at base and apex, with two lateral spines on distal half and nine apical spines. Metatarsi mostly yellowish dorsally and brown ventrally on distal part of segments; basal segment elongate with a strong spine at each side and a row of six smaller spines in between ventrally

along posterior margin; second segment with a strong tooth at each side along posterior margin. Metatibiotarsal formula: (2) 9/8/2.

*Genitalia* ♂: pygofer (Fig. 6 A) narrow and curved, higher than broad in lateral view. Gonostyli (Fig. 6 A) elongate in lateral view, with large lateral tooth of capitulum on short neck. Anal tube (Fig. 6 B) subrectangular in distal 2/3 in dorsal view with slightly emarginate distal margin; strongly narrower on basal 1/3; equally long as wide. Epiproct (Fig. 6 B) located around basal third of anal tube. Phallobase (Fig. 6 C) moderately wide; dorsal lobe with one basal hook-shaped process medially and with posterior margin strongly bisinuate towards apex; ventral lobe emarginate laterally towards apex; with apical margin slightly rounded in middle (Fig. 6 C–D). Aedeagus with pair of big lateral lobes, directed towards ventral side and folding around ventral lobe; distal part with subapical lateral lobe and apex pointed dorsally (Fig. 6 C–D).

**BIOLOGY.** *T. tamdaoensis* sp. nov. was collected at the end of July on lower vegetation, in moist evergreen low mountain forest at an altitude around 1000 m.

### Discussion

The tribe Parahiraciini Cheng & Wang, 1991 in Vietnam now counts seven genera with eleven species (BOURGOIN, 2018). More species of the tribe, and of Issidae more generally, exist in Vietnam but the current low number of dedicated taxonomists does not allow any fast progress in the study of this species-rich family of planthoppers.

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We thank Dr Vladimir Gnezdilov (ZIN) for the loan of *Tetricodes* specimens of his institution and his review of the manuscript; Mr Joachim Bresseel (RBINS), Mr Hong Thai Pham (VNMN) and Mr Vu Tru Hoang (Institute of Ecology and Biological Resources, Hanoi, Vietnam) for their help and permanent enthusiasm during the collecting trips in Vietnam; Mr Xavier Vermeersch (RBINS) for his continuous support during the publication process. This paper is a result of the project “A step further in the Entomodiversity of Vietnam” supported through a grant issued by the capacity building Programme of the Belgian Global Taxonomic Initiative National Focal Point that runs under the CEBioS programme with financial support from the Belgian Directorate-General for Development Cooperation (DGD).

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