



A new genus of the tribe Parahiraciini (Hemiptera: Fulgoroidea: Issidae) from Southern China

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Abstract

A new genus *Tetricodissus* **gen. nov.** with one new species *Tetricodissus pandlineus* **sp. nov.** from Yunnan Province, China, is described and illustrated in the tribe Parahiraciini of planthopper family Issidae. *Fortunia jianfenglingensis* Chen, Zhang & Chang, 2014 is transferred into the genus *Bardunia* Stål, 1863. A key to genera of the tribe Parahiraciini is provided and the taxonomic position of the new genus in Parahiraciini is discussed.

Key words: Hemiptera, Auchenorrhyncha, planthopper, new taxa, morphology, Yunnan

Introduction

The tribe Parahiraciini Cheng & Yang, 1991 is a relatively small group of the planthopper family Issidae Spinola (Hemiptera: Fulgoromorpha), which has received several recent updates (Gnezdilov *et al.*, 2004; Gnezdilov & Wilson, 2005, 2007; Gnezdilov, 2009, 2013; Zhang *et al.*, 2010; Zhang *et al.*, 2012; Zhang *et al.*, 2013; Che *et al.*, 2013; Chen *et al.*, 2014). It is essentially an Oriental tribe that currently groups 46 species in 14 genera (Gnezdilov, 2013; Bourgoin, 2015): *Bardunia* Stål, 1863, *Duriopsilla* Fennah, 1956, *Flavina* Stål, 1861, *Fortunia* Distant, 1909, *Fusiissus* Zhang & Chen, 2010, *Narinosus* Gnezdilov & Wilson, 2005, *Neodurium* Fennah, 1956, *Neotetricodes* Zhang & Chen, 2012, *Paratetricodes* Zhang & Chen, 2010, *Tetricodes* Fennah, 1956, *Folifemurum* Che, Zhang & Wang, 2013; and three other genera unknown from China: *Mincopius* Distant, 1909, *Pinocchias* Gnezdilov & Wilson, 2005 and *Scantinius* Stål, 1866.

According to the identifications keys (Gnezdilov & Wilson, 2007; Zhang *et al.*, 2010, 2012; Che *et al.*, 2013), the tribe is divided into two groups: *Fortunia*, *Mincopius*, *Pinocchias*, *Scantinius*, *Bardunia* and *Narinosus* with an apomorphic strongly extended metope (Figs 23, 27), while the remaining genera are without such an extension. In the last group, *Tetricodes* and *Paratetricodes* differ from all the other genera in the tribe Parahiraciini with the presence of a large apomorphic hemispherical metopial protuberance (Che *et al.*, 2013). In Parahiraciini, only *Neotetricodes* and *Tetricodes* exhibit lateral laminae on perianthrium of male genitalia (Zhang & Chen, 2012), and only *Folifemurum*, *Fusiissus* and *Neodurium* lack the claval suture (or claval suture very obscure) in fore wings. Phylogeny of Parahiraciini is still lacking while an evolutionary scenario of all these taxa was proposed by Gnezdilov & Wilson (2007).

In the present paper, a new genus *Tetricodissus* **gen. nov.** with one new species *Tetricodissus pandlineus* **sp. nov.** from Yunnan Province is described, one species recently described in the genus *Fortunia* is transferred into the genus *Bardunia* and we provide a new key to genera of the tribe Parahiraciini.

Material and methods

A Leica MZ16 microscope was used for observations. The abdomen of specimen was separated after placing in glass cylinder with humid conditions about 12 hours, and then boiled in 10% KOH solution about 5 minutes. Photographs of the specimens were taken using a Nikon EOS 60D camera attached to a Nikon SMZ 1500 microscope and further refined with the Combine ZP software. Terminology for the wing venation follows Bourgoin *et al.*, (2014), male genitalia Bourgoin (1987) and female genitalia Bourgoin (1993). Specimens studied are deposited in the Entomological Museum of Northwest A&F University (NWAUFU), Yangling, China and the Muséum national d'Histoire naturelle, Paris, France (MNHN).

Key to genera of Parahiraciini

1. Metope anteriorly produced, distinctly protruded beyond clypeus in lateral view (Figs 23, 27) 2
- Metope not produced, not forming angle with clypeus in lateral view (Figs 3, 4) 7
2. Anterior margin of metope in dorsal view convex 3
- Anterior margin of metope in dorsal view almost straight or slightly concave medially 4
3. In lateral view, metopial extension long and cylindrical; periandrium without ventral processes
..... *Pinocchias* Gnezdilov & Wilson
- In lateral view, metopial extension shorter and conical; periandrium with a pair of ventral processes *Bardunia* Stål
4. Metope with both median and sublateral carinae 5
- Metope without any intermediate carina on the disc 6
5. Fore wings with wide hypocostal plate (Fig. 24); metope strongly anteriorly produced (Fig. 23); latero-basal margins of gonoplares with developed lobes *Fortunia* Distant
- Fore wings without hypocostal plate; metope slightly produced; latero-basal margins of gonoplares regular
..... *Mincopius* Distant
6. Coryphe twice wider than long; hind wings with narrow anal lobe (Fig. 28); profemora foliated (Fig. 27)
..... *Narinosus* Gnezdilov & Wilson
- Coryphe longer than wide; hind wings with wide anal lobe; profemora not foliated *Scantinius* Stål
7. Metope with black hemispherical protuberance on the disc 8
- Metope without such black hemispherical protuberance on the disc 9
8. Metope with lateral margins parallel each to other, hemispherical protuberance on the middle; periandrium with long and slender lateral processes *Paratetricodes* Zhang & Chen
- Metope with lateral margins slightly enlarged near the base, hemispherical protuberance in its apical half; periandrium with foliaceous lateral laminae *Tetricodes* Fennah
9. Metope without median and sublateral carinae 10
- Metope with median or sublateral carinae 11
10. Coryphe with anterior margin broadly rounded; metope smooth, without any protuberance on disc *Duriopsilla* Fennah
- Coryphe with anterior margin angulately convex; metope with a black fusiform protuberance in the middle
..... *Fustiissus* Zhang & Chen
11. Fore wings with claval suture absent or very obscure (Fig. 25) 12
- Fore wings with claval suture distinct (Figs 1, 2) 13
12. Metope medial disc area smooth (Fig. 26); hind wings developed; metatibiotarsal formula 8/11-19/2 *Neodurium* Fennah
- Metope with whole disc finely granulose; hind wings small, 1-lobed; metatibiotarsal formula 8/8/2
..... *Folifemurum* Che, Zhang & Wang
13. Coryphe longer than broad. In frontal view, metope narrow: dorsal margin more than 1.6 times narrower than its widest part
..... *Flavina* Stål
- Coryphe broader than long. In frontal view, metope wide: less than 1.4 times narrower than its widest part 14
14. Metope with apical margin obviously concave at middle (Figs 5, 6); periandrium with a pair of long ventral processes (Figs 11, 13); fore wings with veins Pcu and A1 fused at basal 2/3 of clavus (Figs 1, 2) *Tetricodissus* **gen. nov.**
- Metope with apical margin straight at middle; periandrium without ventral processes; fore wings with veins Pcu and A1 fused at the middle of clavus *Neotetricodes* Zhang & Chen

Taxonomy

Family Issidae Spinola, 1839

Subfamily Issinae Spinola, 1839

Tribe Parahiraciini Cheng & Yang, 1991

Genus *Tetricodissus* gen. nov.

Type species: *Tetricodissus pandlineus* sp. nov.

Description. Head including eyes approximately as broad as pronotum. Coryphe subrectangular, slightly wider than long, without carina, anterior margin slightly angulately produced, posterior margin angulately concave at the middle (Figs 1, 2). Metope wide, apical margin distinctly concave medially, lateral margins slightly enlarged below eyes, with median carina elevated from apical margin extending near to base, but not reaching postclypeus at disc, sublateral carinae absent (Figs 5, 6). Postclypeus flat, without carina (Figs 5, 6). Rostrum surpassing intermediate coxae in ventral view. Pronotum with some verrucae on disc, median carina absent. Mesonotum without carina. Fore wings elongate, without hypocostal plate, costal margin and claval margin almost paralleled, outer margin obliquely rounded, ScP+R vein forked at basal 1/5, first fork of vein MP near to middle, vein MP3+4 separated before MP1+2, vein CuA simple, claval suture distinct, veins Pcu and A1 fused at basal 2/3 of clavus (Fig. 7), whole fore wing diffused with numerous transverse veins (Figs 1, 2). Hind wings well developed, 3-lobed, with veins reticular, anal lobe extremely narrow (Fig. 8). Hind tibiae with 2 lateral teeth in apical half.

Male genitalia. Anal tube long, slightly surpassing posterior margin of the capitulum of gonostylus (Fig. 9). Gonostylus triangular in profile, caudo-ventral angle acute, capitulum well developed with apical and lateral teeth (Figs 9, 12). Pygofer rectangular in lateral view; posterior margin not strongly caudally produced (Fig. 9). Periandrium symmetrical, basally tubular, with a pair of ventral processes pointing anteriorly (Fig. 13); apical part divide into dorsal lobe, paired lateral lobes and ventral lobe.

Female genitalia. Anal tube elongate, surpassing level of posterior margin of gonoplac. Gonocoxa VIII in dorsal view rectangular, forming a right angle with gonapophysis VIII (Fig. 18). Gonoplacs nearly rounded in lateral view (Fig. 22), in dorsal view fused near base, with basal latero-margin developed in a single lobe (Fig. 21). Hind margin of sternite VII concave medially (Fig. 17).

Etymology. The name is an arbitrary combination between two generic names of issids: *Tetricodes* and *Issus*; the gender is masculine.

Distribution. China (Yunnan).

Remarks. *Tetricodissus* is similar to genus *Neotetricodes* Zhang & Chen, 2012, but differs by 1) the apical margin of metope obviously concave at middle (apical margin straight in *Neotetricodes*), 2) the periandrium with a pair of long ventral processes, without lateral laminae (periandrium with lateral laminae, but without ventral processes in *Neotetricodes*) and 3) veins Pcu and A1 of fore wing fused at basal 2/3 of clavus (veins of clavus fused at middle in *Neotetricodes*). This new genus also differs from *Tetricodes* Fennah, 1956 by the absence of the black hemispherical protuberance on metope, the elevated median frontal carina extending near base and the periandrium without lateral laminae.

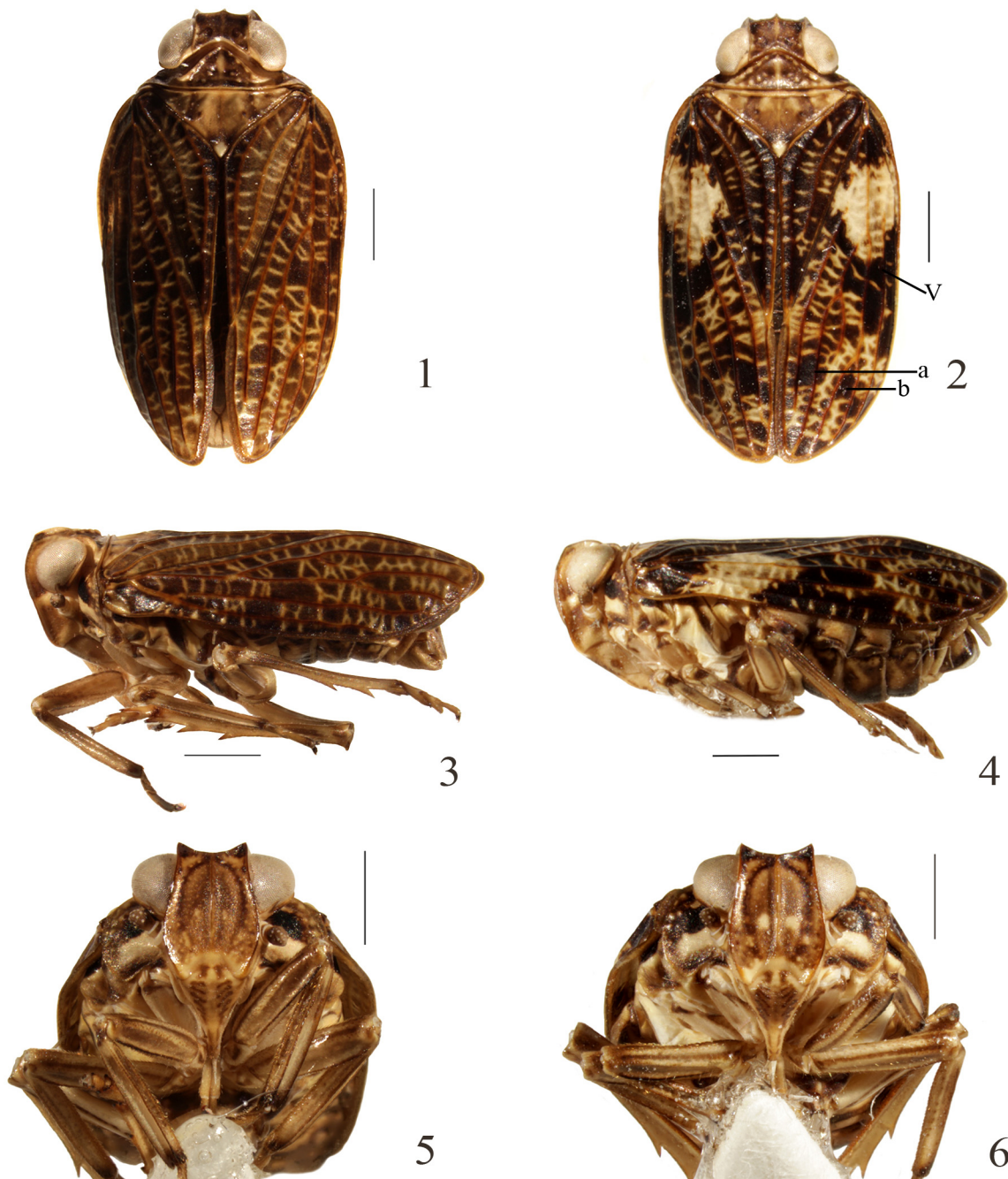
Tetricodissus pandlineus sp. nov.

(Figs 1–22)

Description. Length: male (including fore wings) (N=14): 5.5–6.2 mm; female (including fore wings) (N=11): 6.1–7.2 mm.

Coryphe brown, 1.7 times wider at base than long in midline, with yellow line in middle (Figs 1, 2). Metope brown, 1.2 times broader in midline than widest part, with arc-shaped black markings from apex of disc extending to basal 4/5 and two yellow spots on the side of median carina, several un conspicuous verrucae along the arc-shaped dark marking, apical angles of metope black, basal margin yellow (Figs 5, 6). Postclypeus pale brown, with several oblique dark brown stripes each side, apical margin with two dark brown patches (Figs 5, 6). Eyes grey. Genae brown, with an oblique yellow fascia below eyes. Pronotum brown, 1.2 times longer in midline than coryphe, yellow in midline, each side distributed with about nine verrucae on disc (Figs 1, 2). Mesonotum pale brown, 2.1 times wider in anterior margin than long in midline, with two dark brown longitudinal bands on disc (Figs 1, 2). Fore wings dark brown, 2.6 times longer at longest part than width, main venations reddish brown and elevated, with numerous yellow transverse veins crossed (Figs 1, 2); female paler, a darker V marking more or less

visible (Fig. 2) and 2 darker apical patches diffused (Fig. 2). Hind wings brown. Legs tawny. Metatibiotarsal formula: 8-11-2.

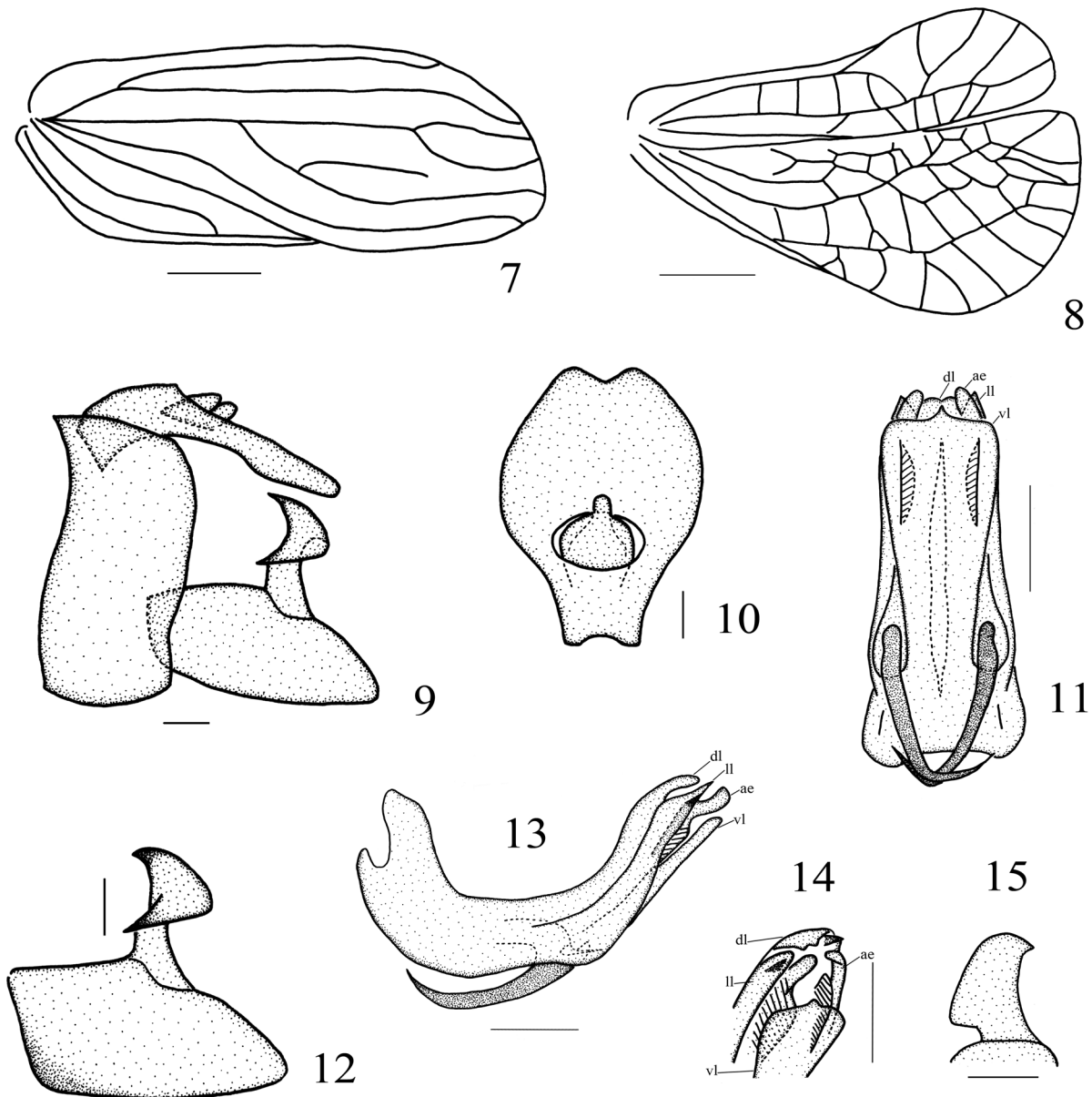


FIGURES 1–6. *Tetricodissus pandlineus* sp. nov., adult. 1. male, dorsal view; 2. female, dorsal view; 3. male, lateral view; 4. female, lateral view; 5. male, frontal view; 6. female, frontal view. Scale bars = 1 mm. Abbreviations: V: V-shaped marking on fore wing; a and b: two apical patches on fore wing.

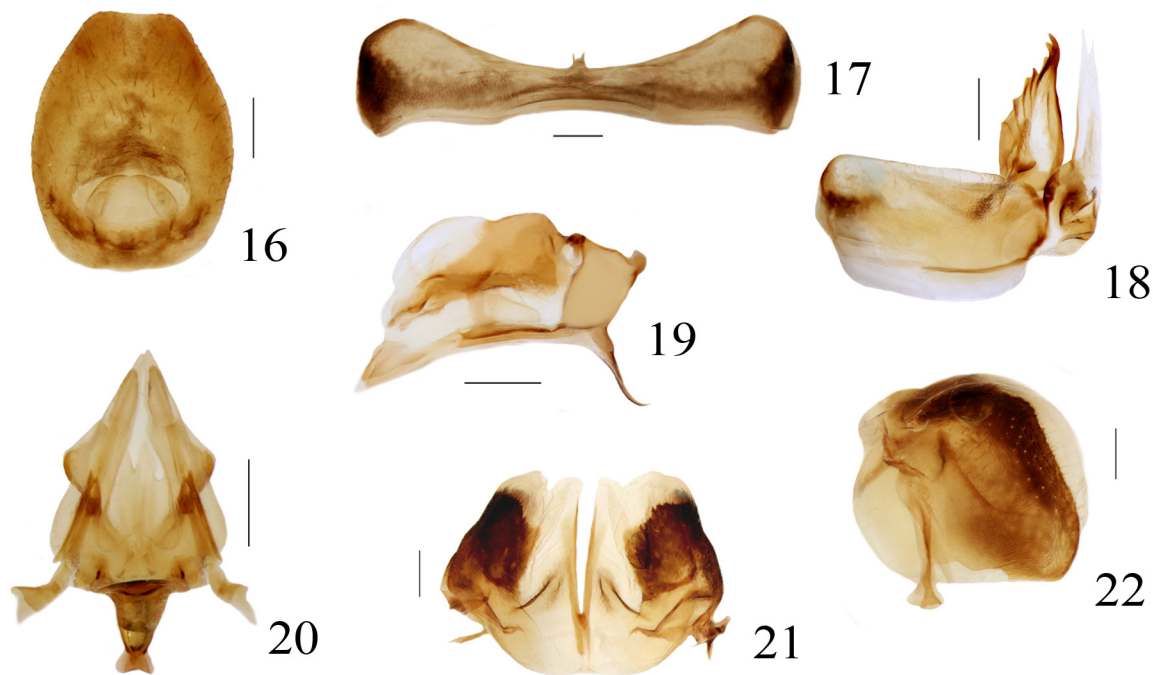
Male genitalia. Anal tube mushroom-like in dorsal view, longer in midline than widest part, with apical margin distinctly concave medially, epiproct short, located at basal 1/3 of anal tube (Fig. 10). Gonostylus symmetrical, nearly triangular in lateral view, gradually tapering to apex, caudo-ventral angle acutely rounded (Figs 9, 12). Capitulum of gonostylus subtriangular (Fig. 12), short and broad in caudal view (Fig. 15). Pygofer broad, in lateral view anterior margin and posterior margin almost paralleled, dorsal margin slightly inclined caudad (Fig. 9). Periandrium with a pair of long acute processes directed cephalad derived from apical 2/3 ventrally (Fig. 13), crossed at middle in ventral view (Fig. 11); dorsal periandrium lobe (dl) slightly shorter than lateral lobes, flattened

(Fig. 13); lateral periandrium lobes (ll) sharpened, with a small apical blackish tooth (Fig. 13); ventral periandrium lobe (vl) flattened, slightly shorter than lateral lobes, in ventral view with apical margin weakly convex medially (Fig. 11). Aedeagus *s.s.* (ae) fully enclosed in periandrium, with apical part paired and digitiform (Figs 11, 13, 14).

Female genitalia. Anal tube in dorsal view oval, apical margin almost straight, lateral margins convex, epiproct located near base (Fig. 16). Hind margin of sternite VII shallowly concave medially, with peculiar furcated median process (Fig. 17). Anterior connective lamina of gonapophysis VIII with two large and one small teeth in apical group and four keeled teeth in lateral group (Fig. 18). Endogonocoxal process membranous and developed, reaching the same level with gonapophysis VIII (Fig. 18). Gonapophysis IX triangular in ventral view, broaden near middle and near base (Fig. 20), posterior connective lamina of gonapophysis IX fused medially. Gonospiculum bridge short and broad. Gonoplasts in dorsal view fused near base, with apical part membranous (Fig. 21), nearly rounded in lateral view (Fig. 22).



FIGURES 7–15. *Tetricodissus pandlineus* sp. nov., male. 7. fore wing; 8. hind wing; 9. genitalia, lateral view; 10. anal tube, dorsal view; 11. phallic complex, postero-ventral view; 12. gonostylus, lateral view; 13. phallic complex, lateral view; 14. apex of phallic complex, postero-dorsal view; 15. capitulum of gonostylus, caudal view. Scale bars 7–8 = 1 mm, 9–15 = 0.2 mm. Abbreviations: dl: dorsal periandrium lobe, ll: lateral periandrium lobe, vl: ventral periandrium lobe; ae: aedeagus.



FIGURES 16–22. *Tetricodissus pandlineus* sp. nov., female. 16. anal tube, dorsal view; 17. sternite VII; 18. gonocoxa VIII and gonapophysis VIII, lateral view; 19. gonapophysis IX and gonospiculum bridge, lateral view; 20. gonapophysis IX and gonospiculum bridge, ventral view; 21. gonoplac, dorsal view; 22. gonoplac, lateral view. Scale bars = 0.2 mm.

Type materials. Holotype: ♂, China: Menglun, N 21° 57' 0.10", E 101° 12' 0.58", 817 m, 18 viii 2011, Mengla County, Xishuangbanna, Yunnan Province, collected by canopy fogging, coll. Guo Zheng (NWAUFU). Paratypes: 6♂♂6♀♀, the same data as holotype (NWAUFU); 7♂♂5♀♀ (6♂♂5♀♀ in NWAUFU, 1♂1♀ in MNHN), China: Menglun, N 21° 36' 12.1", E 101° 34' 23.9", 826 m, 14 vii 2012, Mengla County, Xishuangbanna, Yunnan Province, collected by canopy fogging, coll. Guo Zheng.

Etymology. The combined Latin name refers to the arc-shaped dark markings on both sides of median carina on disc of metope.

Additional taxonomic note

Bardunia jianfenglingensis (Chen, Zhang & Chang, 2014) new. comb.

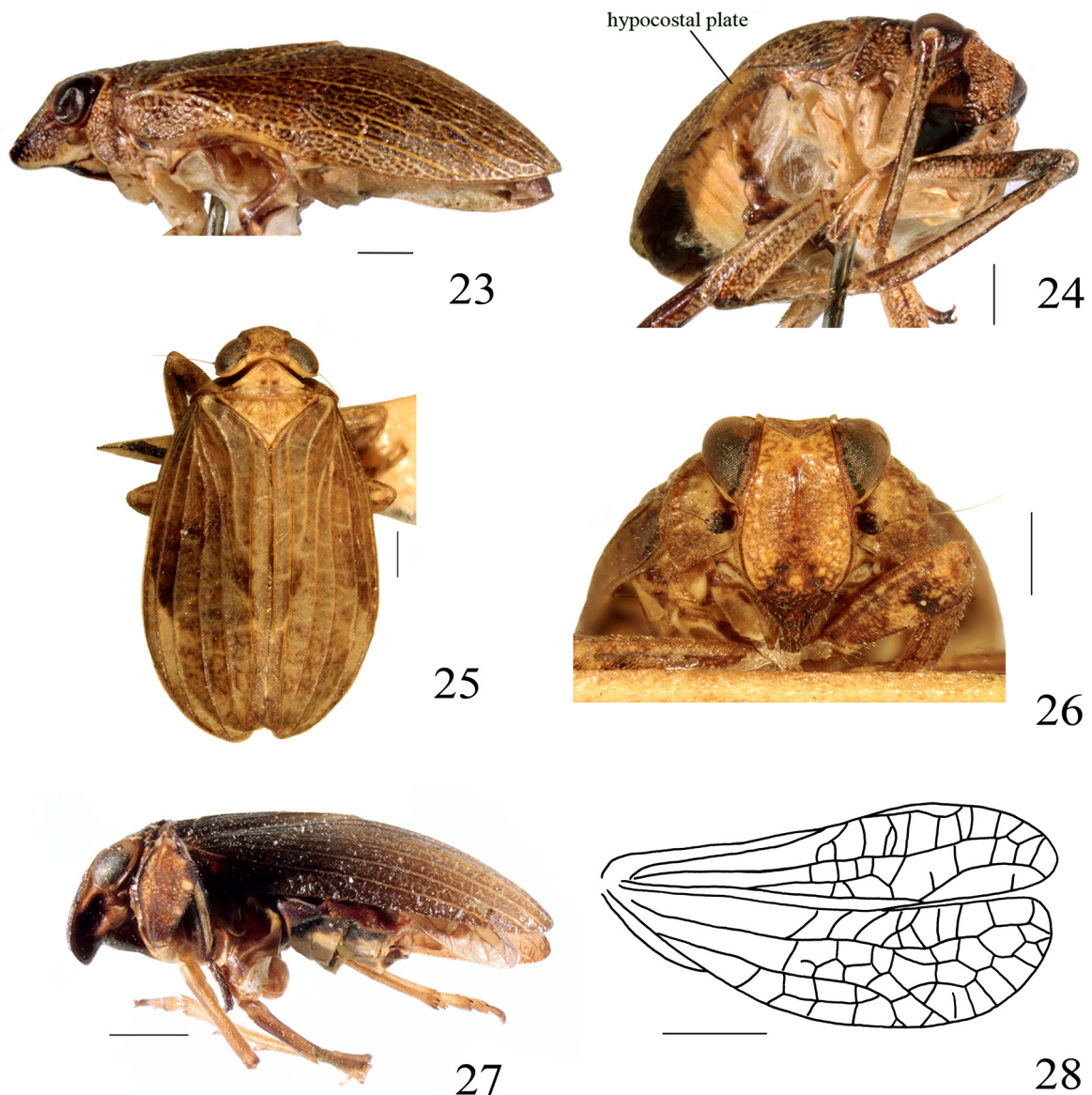
Fortunia jianfenglingensis Chen, Zhang & Chang, 2014: 94

Chen *et al.*, (2014) described one new species *Fortunia jianfenglingensis* Chen, Zhang & Chang in the genus *Fortunia* Distant, 1909, the species was collected from Hainan province, China. However, shape of coryphe, anterior convex margin of metope (in dorsal view), foliated profemora and protibia and the large light spot on protibia (Gnezdilov, 2011) show that the species belongs a group of taxa related to the genus *Bardunia* Stål, 1863 to which it is here transferred waiting for a better placement. Indeed, genus *Bardunia* itself still remains problematic, even it was recently revised by Gnezdilov (2011): male genitalia are not uniform within the genus with dorsal perianthrium process present or absent, ventral pair ones being placed in the first or second third of aedeagus length; the 'two-lobed hind wing' needs to be confirmed as a generic character.

Discussion

Phylogeny of Parahiracini was hypothesized by Gnezdilov and Wilson (2007) discussing a series of characters in terms of *a priori* plesiomorphic/apomorphic status. This evolutionary scenario still needs to be tested: it is only

based on a limited number of characters which congruence was not analyzed. Accordingly, the authors (op. cites) regarded Parahiracini as a "primitive tribe" nested in another tribe: Thioniini. However the monophyly of Parahiracini is just poorly supported by a coleopterous-looking with apically narrowed tegmina and long pro- and meso-legs while three other characters are regarded as plesiomorphic: a 2- or 3-lobed hind wing, a deep cubital notch in the hind wing, and a distal transverse veinlet net. In this scenario, *Tetricodissus* should be considered as part of the "primitive" Parahiraciini with no metopial development, with median metopial carina and regular fore legs. However and obviously, this last group remains only recognized by plesiomorphic characters which are widely distributed and not sufficient to recognize such a lineage. A full and complete phylogeny of the group, taking into account much more morphological characters combined with a molecular approach will be necessary before better tentative: we still remain here with just a taxonomic classification, not a phylogenetical one.



FIGURES 23–28. Adult. 23. *Fortunia byrrhoides* (Walker, 1858), lateral view; 24. *Fortunia byrrhoides* (Walker, 1858), latero-ventral view; 25. *Neodurium postfasciatum* Fennah, 1956, dorsal view; 26. *Neodurium postfasciatum* Fennah, 1956, ventral view; 27. *Narinosus nativus* Gnezdilov & Wilson, 2005, lateral view; 28. *Narinosus nativus* Gnezdilov & Wilson, 2005, hind wing. Scale bars = 1 mm.

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