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REVISION OF THE PLANTHOPPER TRIBE, EODELPHACINI, IN CHINA (HEMIPTERA: FULGOROMORPHA: DELPHACIDAE) WITH DESCRIPTIONS OF A NEW GENUS AND TWO NEW SPECIES

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Abstract

The tribe, Eodelphacini Emeljanov 1995 (Hemiptera: Fulgoromorpha: Delphacidae), was revised to include 3 genera and 4 species in China. One new genus and 2 new species are reported: *Parapunana* **gen. nov.**, *Parapunana liangi* **sp. nov.** (China: Guizhou) and *Prolivatis hainanensis* **sp. nov.** (China: Hainan). One new combination, *Pa. sinica* (Liang, 2002), **comb. nov.** (China: Sichuan), transferred from *Punana* Muir, is proposed. The generic characteristics of *Prolivatis* have been redefined. The main morphological characters, male genitalia of 2 new species above, have been described and illustrated. A key to Eodelphacini in China has been provided.

Key Words: Fulgoroidae, Oriental region, planthopper, taxonomy

Resumen

La tribu, Eodelphacini Emeljanov 1995 (Hemiptera: Fulgoromorpha: Delphacidae), fue revisado para incluir 3 géneros y 4 especies de China. Se presentan un nuevo género *Parapunana* **gen. nov**., y 2 especies nuevas, *Parapunana liangi* **sp. nov**. (China: Guizhou) y *Prolivatis hainanensis* **sp. nov**. (China: Hainan). Se propone una nueva combinación, *Parapunana sinica* (Liang, 2002), **comb. nov.** (China: Sichuan), transferido del género *Punana* Muir. Las características genéricas de *Prolivatis* son redefinidas. Se describen e ilustran las principales características morfológicas y los genitales masculinos para las 2 nuevas especies. Se provee una clave para la tribu Eodelphacini en China.

The delphacid planthopper tribe, Eodelphacini (Hemiptera: Fulgoromorpha: Delphacidae), was erected by Emeljanov (1995) and is characterized by the distal part of the aedeagal shaft arched clockwise (from the base curved to the left); the presence of a row of teeth on the metatarsomere II, in which the marginal teeth are considerably longer than all others; the presence of the sinus on the hindwings opposite CuAP; forewings without postnodal transverse veins; the presence of a well-defined bend of the membrane when the wings are folded; and the intermediate carinae of mesonotum straight (Emeljanov 1995). To date, this tribe includes 21 species in 8 genera: *Eodelphax* Kirkaldy 1901 (2 species, Sri Lanka), *Livatiella* Fennah 1956 (2 species, eastern Caroline Island), *Melanesia* Kirkaldy 1907 (7 species, Borneo, Philippines and Fiji), *Ostama* Walker, 1857 (2 species, Borneo, Mentawi Island), *Paranda* Melichar, 1903 (monotypic, Sri Lanka), *Prolivatis* Emeljanov 1995 (monotypic, Vietnam), *Punana* Muir 1913 (5 species, south India, Borneo, Philippines and southwest China) and *Paralivatiella* Qin and Zhang, 2010 (monotypic, south China) (Liang & Jiang 2002; Qin & Zhang 2010).

The Eodelphacin fauna of China remains inadequately studied. Presently only a small number has been recorded, i.e., Liang & Jiang (2002) dealt with 1 genus and 1 species: *Punana sinica* Liang 2002 (in Liang & Jiang 2002), which was distributed only in southwest China (Sichuan Province); Qin & Zhang (2010) reported 1 new genus (*Paralivatiella*) and 1 new species (*Pa. serrata*) from Yunnan Province, and redescribed *Prolivatis gorochovi* Emeljanov from Hainan Province.

In the present paper, a new species of the genus *Prolivatis* Emeljanov, which was recently collected from Hainan Province, south China, is described. The new species also represents the second species of *Prolivatis*. One new genus, *Parapunana* **gen. nov.**, is erected to accommodate a new species, which was recently found in Guizhou Province,

southwest China, and *Punana sinica* Liang 2002 (southwest China, Sichuan). The generic characteristics of *Prolivatis* are redefined. The main morphological characters, male genitalia of 2 new species mentioned above are described and illustrated. A key to Eodelphacini in China is provided.

Materials and Methods

Morphological terminology follows that of Yang & Yang (1986). The genital segments of the examined specimens were macerated in 10% KOH and drawn from preparations in glycerin jelly using a light microscope. Illustrations of the specimens were made by using Leica MZ 12.5 stereomicroscope. Spinal formula means the numbers of apical spines of the hind tibiae and 1st and 2nd hind tarsomeres.

The type specimens and materials examined are deposited in the Institute of Entomology, Guizhou University, Guiyang, Guizhou Province, China (IEGU).

Descriptive Taxonomy

Key to Genera and Species of Eodelphacini in China

1. Sc+R in forewings with one branch before subapical transverse nodal line . . . . . *Paralivatiella serrata* Qin and Zhang

— Sc+R in forewings with branches before subapical transverse nodal line 2

2. Vertex narrow and long, lateral margins subparallel, submedian carinae distinct, branches of Y-shaped carina forming an obtuse angle (Figs. 1, 29 and 31); frons narrow and long, widest at apical 1/3, median carina distinct and keeled (Figs. 2 and 32); forewings distributed with many small pale tubercles (Figs. 3, 29 and 30); M_3+M_4 of hindwings forked deeply (Fig. 4); male pygofer ventrally with a median club-shaped projection and a pair of lanceolate lobes laterally (Fig. 12); aedeagal shaft laterally with several long spinous processes (Figs. 15-17); the male genital styles very slender and narrow (Fig. 14). . . . . *Prolivatis* Emeljanov, 3

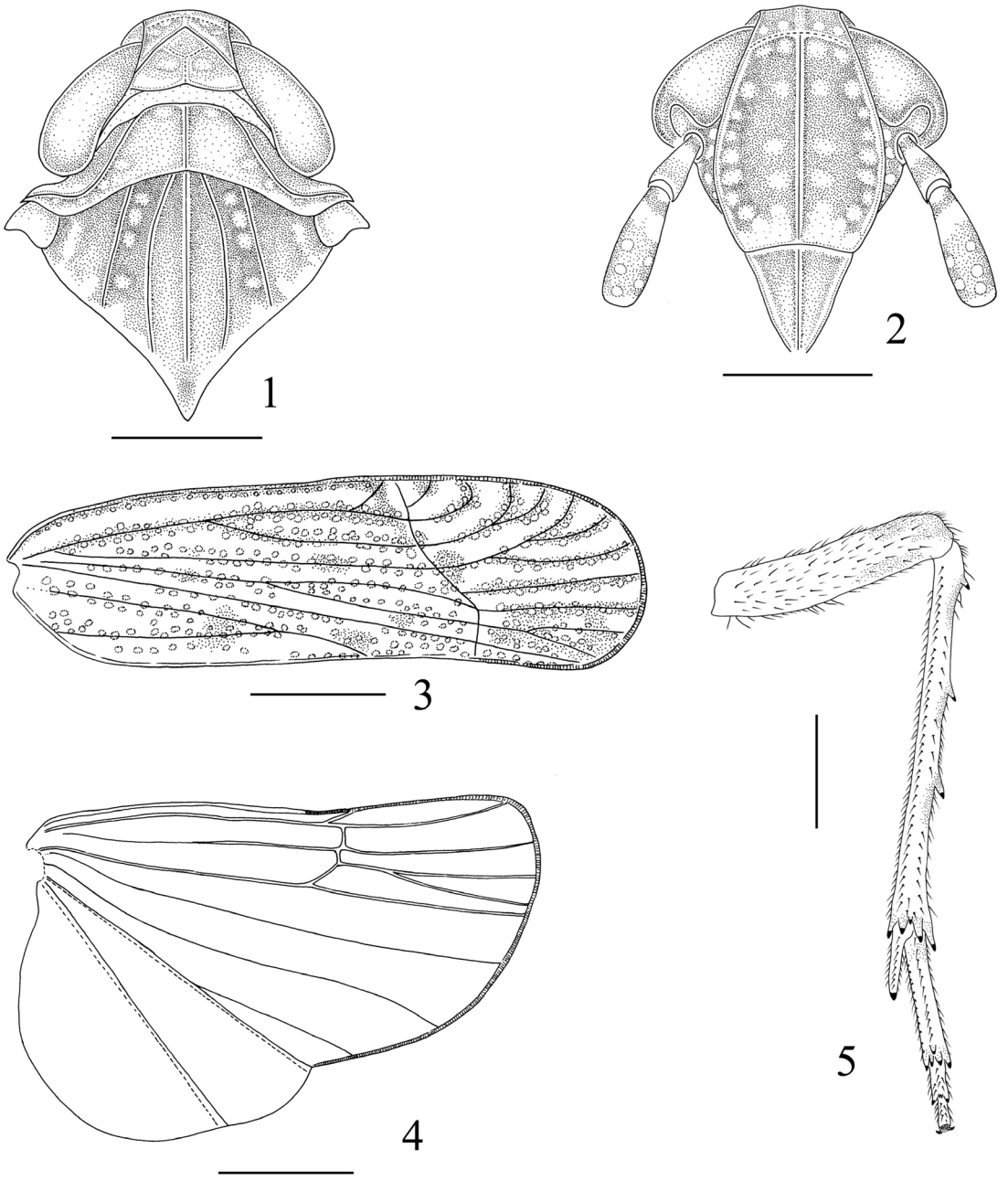
— Vertex wide and short, lateral margins markedly diverging apically and basad, submedian carinae with apical half very faint, branches of Y-shaped carina almost forming a straight line (Figs. 18, 33, 35); frons wide and short, widest at midlength slightly near to apex, longitudinally convex, median carina very faint (Figs. 19 and 36); forewings distributed with many small dark brown setiferous tubercles (Figs. 20, 33 and 34); M_3+M_4 of hindwings forked shallowly (Fig. 21); male pygofer ventrally with a median triangular projection (Fig. 24); aedeagal shaft laterally without long spinous process (Figs. 27 and 28); the male genital styles broad (Fig. 26). . . . . *Parapunana* **gen. nov**., 4

3. Hind margin of anal segment with median concavity (Figs. 6 and 7), in lateral view, distinct deep concavity of left margin situated rather apically (Fig. 8); pygofer with lateral margins asymmetrical (Figs. 10-13); medioventral process of pygofer club-shaped, long, attaining 2/3 length of lateral lobes, not enlarged apically (Fig. 12); lateral lobes narrow and elongate (Fig. 12). . . . . *Prolivatis hainanensis* **sp. nov**.

— Hind margin of anal segment convex, in lateral view, distinct deep concavity of left margin situated rather basally; pygofer with lateral margins symmetrical; medioventral process of male pygofer nearly ball-shaped, short, only attaining 1/2 length of lateral lobes, enlarged apically; lateral lobes wide and short . . . . . *Prolivatis gorochovi* Emeljanov

4. Vertex centrally with a dark brown rounded spot; frons with columns of small rounded pale spots; male pygofer in ventral view, medioventral process large, slightly higher than lateral lobes. . . . . .*Parapunana sinica* (Liang) **comb. nov.**

— Vertex without the above spot (Figs. 17, 32 and 34); frons brown, without rounded pale spot (Figs. 18 and 35); male pygofer in ventral view, ventral margin strongly broadly excavated, medioventral process small, distinctly lower than lateral lobes (Fig. 23) . . . . . *Parapunana liangi* **sp. nov.**



Figs. 1-5. *Prolivatis hainanensis* **sp. nov.** 1. Head and thorax; 2. Frons and clypeus; 3. Forewing; 4. Hindwing; 5. Hind leg. Scale bars: = 0.5 mm (Figs. 1, 2 and 5); 1 mm (Figs. 3 and 4).

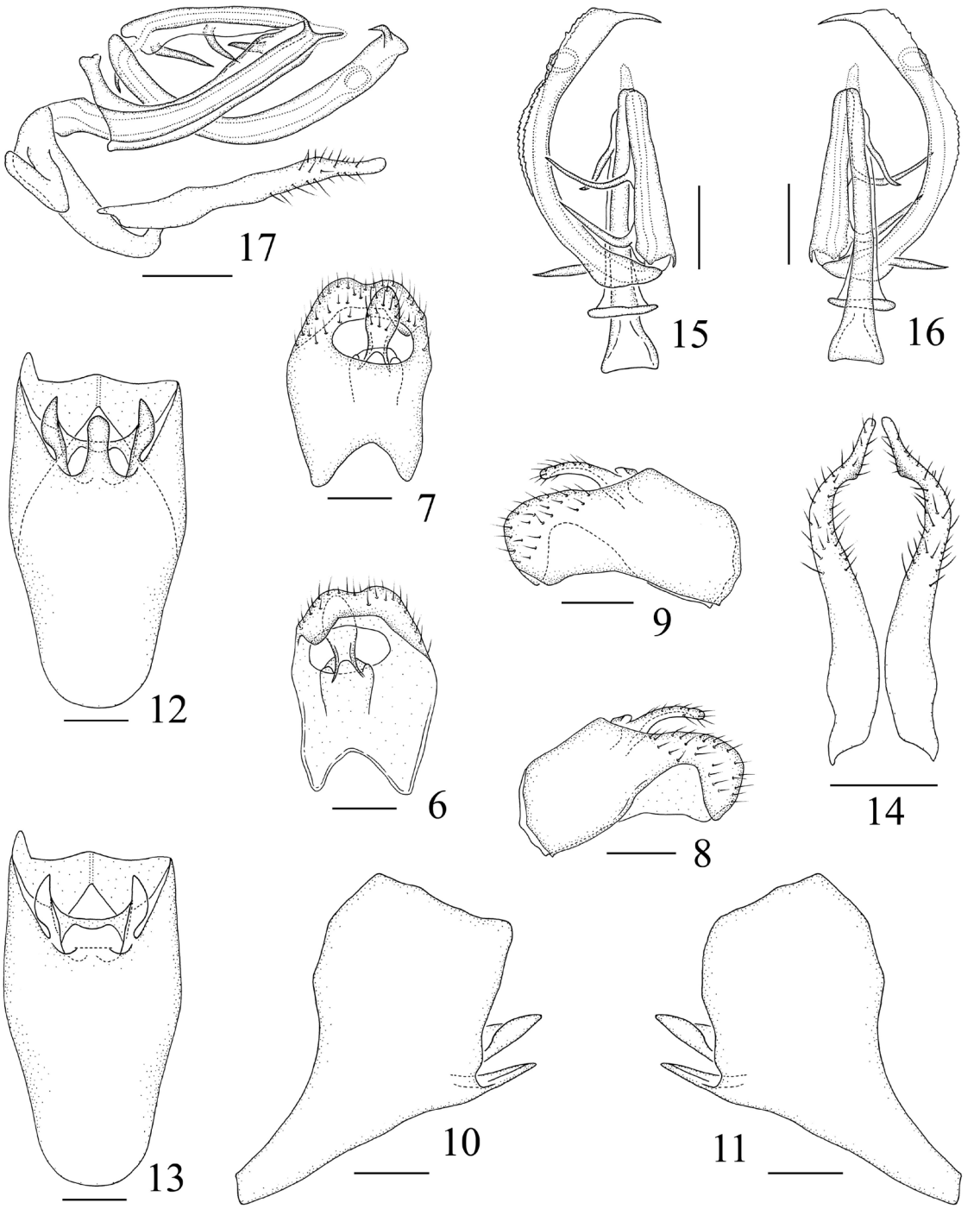
Paralivatiella Qin and Zhang 2010

Paralivatiella Qin and Zhang 2010: 17

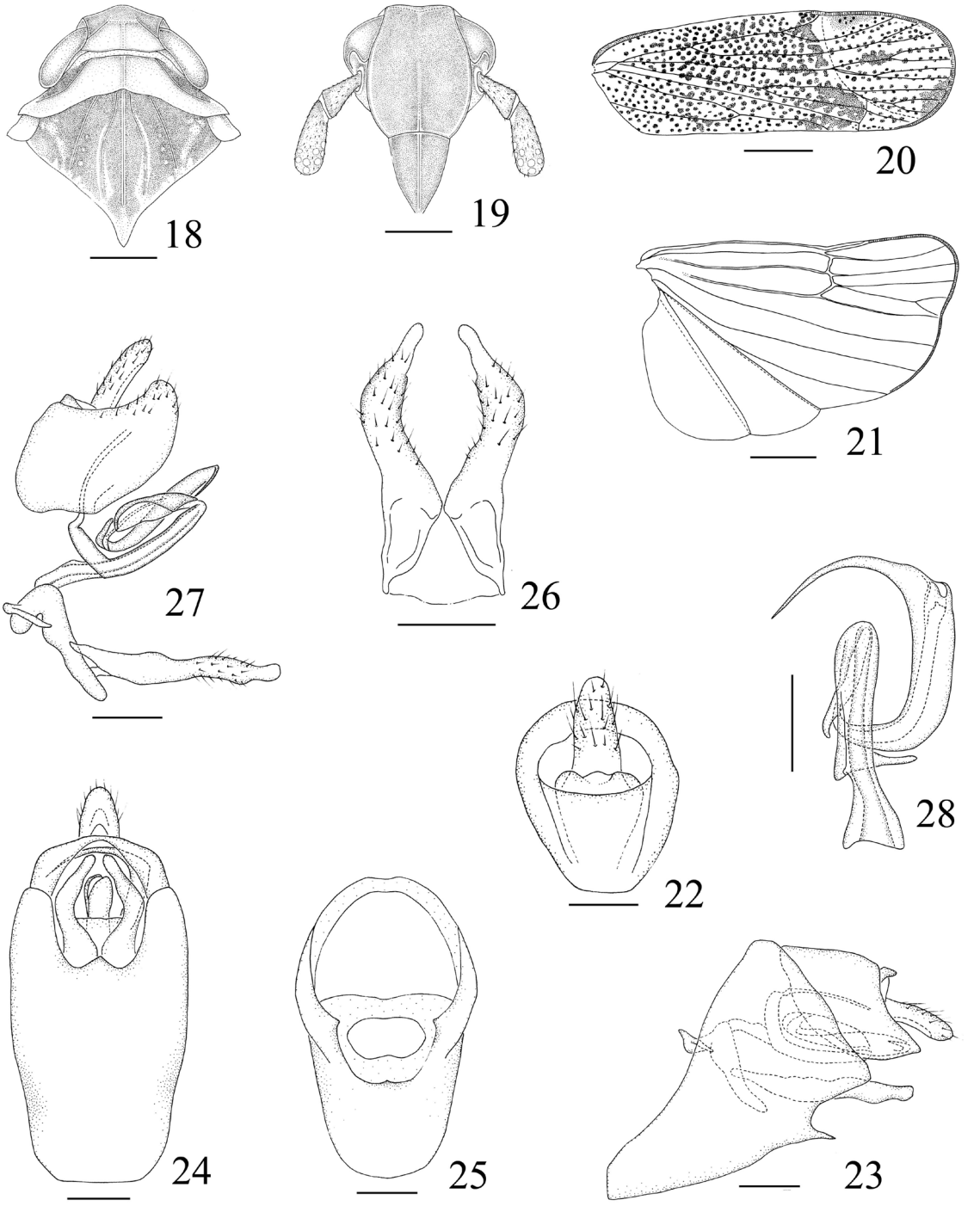
Type species: *Paralivatiella serrata* Qin and Zhang, by original designation.

Description

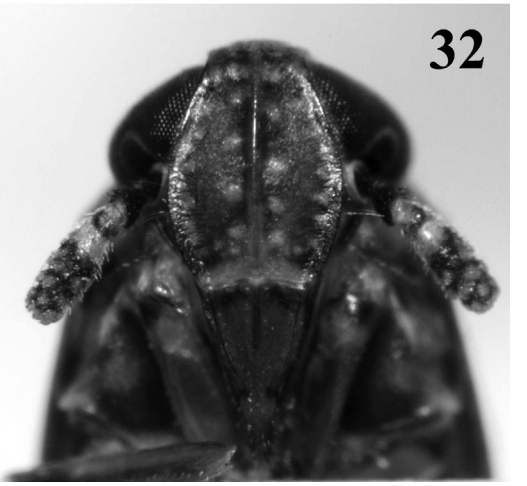
Head longer and narrower than pronotum. Vertex quadrate, slightly broader than long, anterior margin of vertex rounded, projecting in front of eyes, in profile rounded to frons, submedian carinae arising near base of lateral carinae, con-



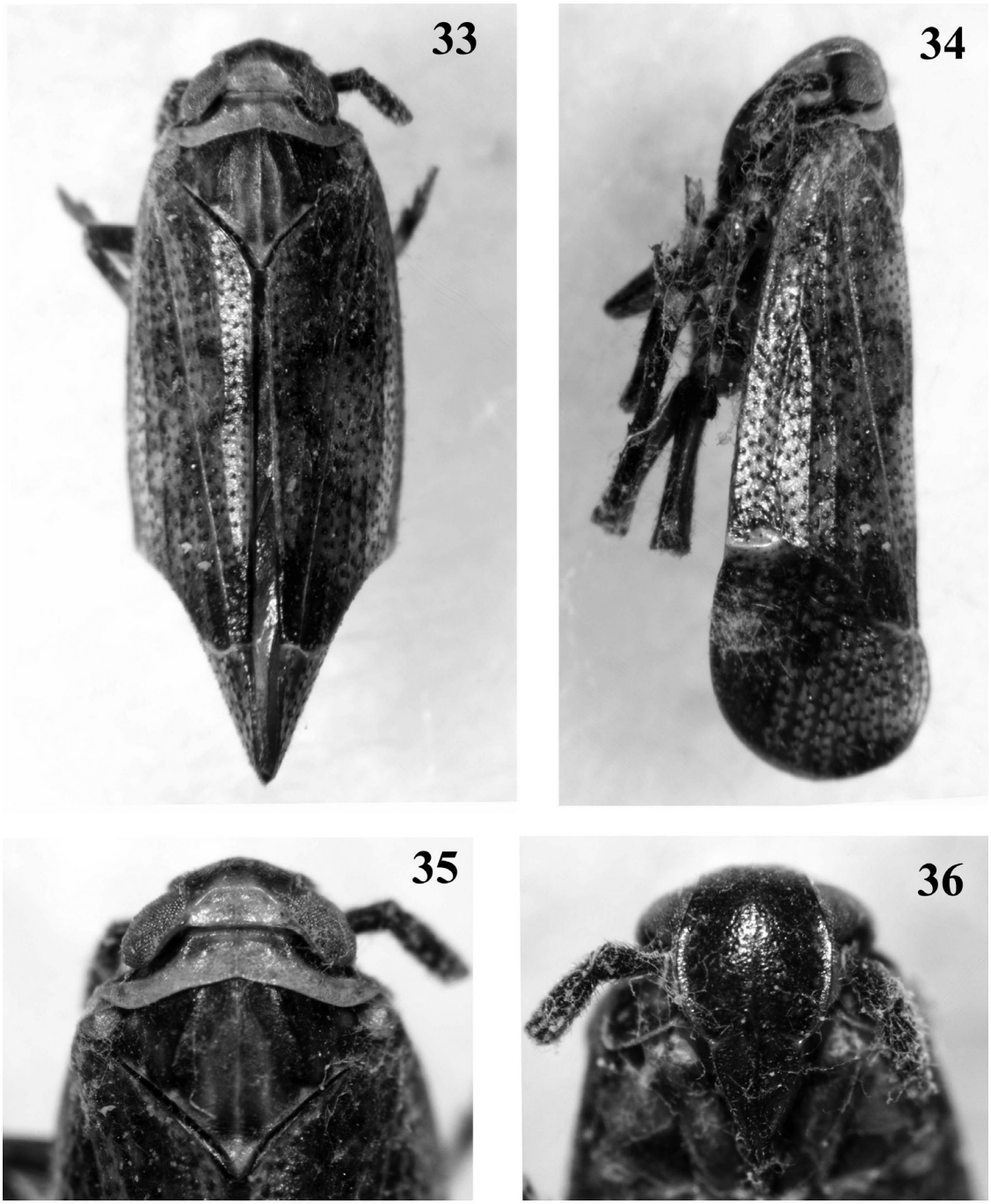
Figs. 6-17. *Prolivatis hainanensis* **sp. nov.** 6. Anal segment, ventral view; 7. Anal segment, dorsal view; 8. Anal segment, left side; 9. Anal segment, right side; 10. Pygofer, left lateral view; 11. Pygofer, right lateral view; 12. Pygofer, ventral view; 13. Pygofer, ventral view (median projection was removed); 14. Genitalia styles, ventral view; 15. Aedeagus, dorsal view; 16. Aedeagus, ventral view; 17. Aedeagus, connective and genital style, lateral view. Scale bars: = 0.2 mm.



Figs. 18-28. *Parapunana liangi* **sp. nov.** 18. Head and thorax; 19. Frons and clypeus; 20. Forewing; 21. Hindwing; 22. Anal segment, dorsal view; 23. Male genitalia, lateral view; 24. Male genitalia, ventral view; 25. Pygofer, posterior-ventral view; 26. Genital style, ventral view; 27. Aedeagus, connective and genital style, lateral view; 28. Aedeagus, ventral view. Scale bars: = 0.5 mm (Figs. 18 and 19); 1 mm (Figs. 20 and 21); 0.2 mm (Figs. 22-28)



Figs. 29-32. *Prolivatis hainanensis* **sp. nov.** 29. Dorsal habitus (paratype ♀); 30. Lateral habitus (paratype ♀); 31. Head and thorax, dorsal view (paratype ♀); 32. Frons and clypeus (paratype ♀).



Figs. 33-36. *Parapunana liangi* **sp. nov.** 33. Dorsal habitus (paratype ♀); 34. Lateral habitus (paratype ♀); 35. Head and thorax, dorsal view (paratype ♀); 36. Frons and clypeus (paratype ♀).

verging and meeting before apex of vertex, forming isosceles triangle at base of vertex, Y-shaped carina with stem obscure. Median carina of frons simple. Lateral carinae of pronotum sinuate, not reaching posterior margin. Mesonotum with 5 carinae. Antennal segments distinctly elongate. Forewings with continuous transverse veins and with membrane bent down at rest, with 12 closed apical cells, Sc+R with one branch before subapical transverse nodal line. Hind tibiae with 3 lateral teeth, metatarsomere I with 5 apical teeth, metatarsomere II with row of teeth, mar-

ginal teeth longer than other teeth. Post tibial spur spine-like, without teeth on inner margin, Male pygofer strongly excavated ventrocaudally, with small median process on midventral margin. Aedeagus 3-segmented, distal segment arched clockwise. Genital styles simple, convergent apically; anal segment without processes, anterior margin strongly excavated inwardly (Qin and Zhang, 2010).

Host Plant

Unknown.

Distribution

Southwest China (Yunnan Province).

Paralivatiella serrata Qin and Zhang, 2010

Paralivatiella serrata Qin and Zhang, 2010: 17

Material Examined

No specimens of this species were available for this study.

Host Plant

Unknown.

Distribution

Southwest China (Yunnan Province).

Prolivatis Emeljanov 1995 (Figs. 1-17, 29-32)

Prolivatis Emeljanov 1995: 138; Qin & Zhang, 2010: 20

Type species: *Prolivatis gorochovi* Emeljanov 1995, by original designation.

Description

Head and thorax. Head (Figs. 1 and 29) including eyes narrower than or equal to pronotum. Vertex nearly quadrate, median length shorter than basal wide (0.67:1), anterior margin roundly produced, narrower at apex than at base (0.83:1), Y-shaped carina not well defined, lateral carinae distinct but not keeled, subparallel to each other, submedian carinae markedly keeled, originating from 1/4 of lateral margins and uniting before anterior margin, together with basal margin in form of isosceles triangular area, which depressed medially. Frons (Figs. 2 and 32) gradually widened from base to apical 1/3, then narrowed to apex, longer in median line than wide in widest part about 1.40 times, widest at apical 1/3. Clypeus with median carina and lateral carinae, median carina markedly keeled. Antennae (Figs. 2 and 32) with scape widened distad, longer than wide at apex about 1.5-1.78 times, pedicel cylindrical, longer than wide more than 3.0 times, longer than scape about 2.5-3.0 times. Pronotum (Figs. 1, 29 and 31) slightly shorter than vertex (0.9:1), tricarinate, lateral carinae curved laterad, attaining posterior margin. Mesonotum (Figs. 1, 29 and 31) longer in middle line than pronotum and vertex together (1.79-1.89:1), with 5 longitudinal carinae on disk (one median carina and pairs of lateral carinae), outer lateral carinae straight, inner lateral carinae slightly curved, diverging posteriorly. Forewing (Figs. 3, 29 and 30) narrow and elongate, about 3.38-3.43 times as long as wide, obliquely depressed laterally, apex rounded, veins distinctly prominent and thickly covered with pale granules, forewing venation appears as in Fig. 3. Hindwing (Fig. 4) large and wide, with M_3+M_4 forked deeply. Legs moderately long, hind tibiae (Fig. 5) with 3 lateral spines on outer edge, 5 apical spines and a long apical conical mobile spur, metatarsomere I with 5 apical spines: 4 spines in a row and the fifth, middle spine, shifted proximally from the row, metatersomere II with 3 apical spines (outer side 2, inner side 1).

Male Genitalia. Anal segment of male (Figs. 6-9) narrow and elongate. Anal style slender, small and short. Pygofer in profile (Figs. 10 and 11) with dorsal margin much shorter than ventral margin, posterior margin produced medially, in ventral view (Fig. 12) narrow and elongate, apex wider than base, ventral margin with median projection, lateral to which lies pair of wide lanceolate lobes with tapered prolonged tips. Genital styles (Fig. 14) slender and elongate, distinctly angulately produced laterad near apical 1/3 length in ventral aspect, base wide, tapered to apex, directed inwardly. Connective (Fig. 17) short, slender, tubular. Diaphragm (Fig. 13) narrow and transverse. Aedeagus (Figs. 15-17) with phallobase slender, long, tubular; flagellum directed cephalad then recurving to right and finally to left and cephalad, and terminating in a spinose process, gonopore near the apex of shaft.

Host Plant

Unknown.

Distribution

Oriental Region (Vietnam and China).

Remarks

When Emeljanov (1995) erected the genus *Prolivatis* based on *Pr. gorochovi*, a species from Vietnam, he pointed out that it was close to the

genus *Punana* Muir in terms of external appearance and most characters. Unfortunately, the details of differences between these 2 genera were not listed by Emeljanov (1995). However, based on 2 described species in *Prolivatis*, this genus can be distinguished from *Punana* by the following characters: antennal pedicel slender and long, cylindrical; genital styles slender and narrow; ventral margin of pygofer with a median club-shaped or ball-shaped projection and a pair of lateral lanceolate lobes and aedeagus laterally with several long spinose processes.

Prolivatis hainanensis, **sp. nov.** (Figs. 1-17, 29-32)

Material Examined

Holotype ♂, Bawangling National Natural Reserve (19°04'N, 109°07'E), Hainan Province, China, 478-817m, 24-28 April 2009, X.-H. Hou; paratype: 3 ♂, 6 ♀, same data as holotype; 1 ♂, Wuzhishan National Natural Reserve (18°53´N, 109°41'E), Hainan Province, 14 April 2009, X.-H. Hou; 1 ♂, 7 ♀, Jianfengling National Natural Reserve (18°42'N, 108°47'E), 1000-1400m, 17-20 April 2009, X.-H. Hou (IEGU).

Etymology

This species name is derived from the name of the holotype locality, Hainan Province, China.

Description

Body length (from apex of vertex to tip of forewing): ♂ 5.00-5.61 mm (N = 7), ♀ 5.50-6.32 mm (N = 13); forewing length: ♂ 4.32-4.80 mm (N = 7), ♀ 4.70-5.45 mm (N = 13).

Coloration. General color (Figs. 29-32) yellowish brown to brown. Vertex (Figs. 1, 29 and 31) brown, with central pale rounded spots. Frons (Figs. 2 and 32) mostly brown except apex yellowish brown, with columns of small rounded pale spots (one next to median longitudinal carina and the other on lateral margin). Clypeus (Figs. 2 and 32) brown at base, pale brown at apex; rostrum pale brown, apex dark brown. Genae pale brown to brown, with small rounded pale spots, the areas between eyes and frons dark brown, with a row small rounded pale spots. Antennae (Figs. 2 and 32) with scape dark brown at apex and base, pale brown at middle, pedicel having a dark brown ring at base, brown to dark brown from middle to apex, sensory fields yellowish brown. Eyes brown to dark brown, anterior margin somewhat reddish brown. Pronotum (Figs. 1, 29 and 31) pale brown to brown, with a row small rounded pale spots along inside of lateral carinae. Mesonotum (Figs. 1, 29 and 31) dark reddish brown at lateral areas, brown at central areas and yellowish brown at apex and hind margin, with a row small rounded pale spots along inside of out lateral carinae. Tegula (Figs. 29 and 31) yellowish brown. Forewings (Figs. 3, 29 and 30) yellowish brown, veins pale brown to brown, with irregular brown to dark brown markings, granules pale yellowish brown. Hindwings light fuliginous, veins brown. Thorax ventrally yellowish brown, pleura with fuscous spots. Legs (Fig. 30) yellowish brown, with dark brown rings, tarsi and claws brown, tips of apical spines on hind tibiae and tarsi black. Abdomen with tergites brown to dark brown and sternites pale yellowish brown.

Head and Thorax. Structural characters as in generic description. Head including eyes narrower than pronotum (0.89: 1), about 0.67 times as long as wide at base, width of apex narrower than that of base (0.83:1). Frons about 1.41 times longer in median line than width in widest part. Antennae with scape about 1.78 times longer than wide at apex, pedicel about 3.18 times longer than wide, about 2.5 times longer than scape. Mesonotum longer in middle line than pronotum and vertex together (1.79:1). Forewing about 3.38 times as long as wide. Hindwings about 1.55 times as long as wide.

Male genitalia. Anal segment of male in profile (Figs. 8 and 9) with dorsal and ventral margins of basal half subparallel, apical half produced ventrad, ventral margin of left side forming a converse U-shaped excavation, in ventral and dorsal view (Figs. 6 and 7) with apical margin concave medially, left apex produced ventrad into a rounded lobe, anal style moderately long. Pygofer in left lateral view (Fig. 10) with posterior margin produced caudad rectangular at midlength, with upper and lower half margins nearly straight; in right lateral view (Fig. 11) posterior margin produced caudad rounded at midlength; in ventral view (Figs. 12 and 13) with lateral margins asymmetrical, median projection club-shaped, narrow and elongate, apex rounded; lateral lanceolate lobes narrow and elongate. Each genital style (Figs. 14 and 17) curved into a semicircle then straightened juts backward for apical 1/3 in ventral aspect, apical 1/5 straight, directed inwardly, apex slightly rounded, apical half covered with long hairs on surface. Diaphragm (Fig. 13) very narrow, transverse, with upper margin nearly straight and lower margin sinuate. Aedeagus (Figs. 15-17) has 4 long spinous processes at right side: one near apex of phallobase, 2 at flagellum directed cephalad, and 1 near the base of C-shaped shaft; phallobase having a membranous lobe at apex; aedeagal shaft nearly C-shaped, somewhat compressed, apex abruptly produced into a small spinous

process, outer margin with 2 rows small teeth, gonopore at apical 1/4 on right lateral surface.

Host Plant

Unknown.

Distribution

South China (Hainan).

Remarks

The new species *Prolivatis hainanensis* was misidentified as *P. gorochovi* by Qin & Zhang (2010) based on 1 male and 5 female specimens from Hainan Province of China and its body length (from apex of vertex to tip of forewing) seems to have been incorrectly measured with male being 3.75 mm, female 4.57-4.59 mm. Based on the descriptions of the shape of anal segment was correctly described by Emeljanov in latest personal communication and illustrations of *gorochovi* in Emeljanov (1996), this species can be distinguished from *gorochovi* by the shape and structures of anal segment and pygofer (the detailed differences can be seen in the above key).

Parapunana **gen. nov.** (Figs. 18-28, 33-36)

Type species: *Parapunana liangi* **sp. nov.,** here designated.

Etymology

The genus name, which is feminine, is a combination of "para" (similar to) and "punana" (name of the related genus), meaning that this genus resembles genus *Punana*.

Description

Head and thorax. Head (Figs. 18, 33 and 35) including eyes distinctly narrower than pronotum (0.81:1), broadly roundly produced anteriorly. Vertex (Figs. 18, 33 and 35) very short, about 2 times wider at base than long in middle line, slightly wider at apex than at base, disk foveate with a very faint median carina, submedian carinae originating from basal 1/3 of lateral margin, and meet Y-shaped carina at middle, from where apical carinae becoming very faint. Frons (Figs. 19 and 36) wide and rounded, about 1.11-1.17 times longer in median line than wide in widest part, widest at midlength near apex, median carina simple and very faint, basal margin truncate, lateral margins convex medially laterad, disk longitudinally convex. Postclypeus (Figs. 19 and 36) more than half length of frons, convex medially, lateral marginal areas depressed, with median longitudinal carina. Rostrum long, reaching between hind trochanters, basal segment long, apical segment short, greater than 1/2 length of basal segment. Antennae (Figs. 19 and 36) moderately long, scape and pedicel with many sturdy bristles on surface, scape shorter than pedicel (0.67:1), with base distinctly narrow, strongly broadening toward apex, apex distinctly wide; pedicel cylindrical, slightly broadening toward apex. Pronotum (Figs. 18, 33 and 35) centrally slightly shorter than vertex (0.77-0.95:1), disk slightly sloping anteriorly, anterior lateral areas strongly sloping laterad, hind margin centrally slightly arched anteriorly, with median longitudinal carina. Mesonotum (Figs. 18, 33 and 35) longer than vertex and pronotum combined (2.05-2.08), with 5 longitudinal carinae on disk (one median carina and pairs of lateral carinae), outer lateral carinae straight, inner lateral carinae slightly curved, diverging posteriorly, extreme apex somewhat lobately produced. Forewing (Figs. 20, 33 and 34) narrow and elongate, about 3 times as long as wide, obliquely depressed laterally, apex rounded, veins distinctly prominent and thickly covered with fuscous granules with long setae, a more or less continuous series of transverse veins before apical area, forewing venation show as in Fig. 20. Hindwing (Fig. 21) large and wide, with M_3+M_4 forked shallowly. Legs moderately long, hind tibiae with 3 lateral spines on outer edge, 5 apical spines and a long apical conical mobile spur, metatarsomere I with 5 apical spines: 4 spines in a row and the fifth, middle spine, shifted proximally from the row, metatersomere II with 3 apical spines (outer side 2, inner side 1).

Male Genitalia. Anal segment of male large, wide and short, ring-like, in lateral view (Figs. 23 and 27) with ventral margin convex, apex produced caudad, in dorsal view (Fig. 22), gradually widening from base to apex, broadly rounded apically, anal style slender, small and short. Pygofer in lateral view (Fig. 23) elongate, very short anteriorly and very high posteriorly, dorsal margin very short and ventral margin very long, posterior margin strongly produced caudad angulately; in ventral view (Fig. 24) narrow and long, apex broader than base, ventrocaudal margin broadly excavated with a median broad triangular process. Genital styles (Fig. 26) slender and elongate, distinctly angulately produced laterad near midlength in ventral aspect, base wide, tapered to apex, somewhat constricted medially, apical 1/2 directed inwardly and covered with long hairs on surface. Connective (Fig. 27) short, slender, tubular. Diaphragm (Fig. 25) narrow, transverse. Aedeagus (Figs. 27 and 28) with phallobase moderately long, tubular; flagellum directed cephalad then recurving to right and finally to left and cephalad, and terminating in a long spinose process, gonopore at the base of long spinose process on right surface.

Distribution

Oriental region (southwest China).

Remarks

The new genus *Parapunana* is distinguished from other genera in the tribe Eodelphacini by the shape and length of the antennae, the shape of vertex and frons, the number of longitudinal carinae on mesonotum, the number of lateral spines on hind tibiae, the wing venation, and the minutiae of the male genitalia, as noted above.

Parapunana is closely related to *Punana* Muir, but can be distinguished from the latter by the following characters: vertex wide and short, broadening toward apex, wider at apex than at base, apical half of submedian carinae very faint, branches of Y-shaped carina forming almost a straight line (in the latter, vertex narrow and long, lateral margins parallel, submedian carina distinct, uniting before anterior margin, branches of Y-shaped carina forming a right angle); frons wide and rounded, disk longitudinally convex, median carina very faint (in the latter, frons narrow and long, disk depressed, median carina distinct and keeled); antennae with pedicel cylindrical, slightly broadening apically (in the latter, pedicel ovate, narrowing apically); hindwings with M_3+M_4 forked shallowly, branches distinctly shorter than stalk (in the latter, M_3+M_4 forked deeply, branches distinctly longer than stalk).

Parapunana is also closely related to *Livatiella* Fennah, but can be separated from *Livatiella* by: the head including eyes distinctly narrower than pronotum (head as wide as pronotum in *Livatiella*); the vertex wide and short, apical half of submedian carinae very faint (vertex narrow and long, submedian carinae distinct in *Livatiella*), the eyes small (rather large in *Livatiella*); the forewing with Sc+R with branches before subapical transverse nodal line (one branch in *Livatiella*).

Parapunana can be distinguished from *Melanesia* Kirkaldy and *Paranda* Melichar by the hind tibiae having 3 lateral spines (two in *Melanesia* and *Paranda*) and the antennal pedicel distinctly short (distinctly elongate in *Melanesia* and *Paranda*).

Parapunana can be distinguished from *Eodelphax* Kirkaldy by the antennal scape and pedicel subcylindrical (both scape and pedicel compressed and scape obliquely triangular in *Eodelphax*).

Parapunana differs from *Prolivatis* Emeljanov in the characters listing in the above key.

Parapunana differs from *Ostama* Walker in that the antennae short (very elongate in *Ostama*), mesonotum with 5 carinae (3 in *Ostama*) and forewings with about 12 closed apical cells (about 15 in *Ostama*).

Parapunana liangi **sp. nov.** (Figs. 17-27, 32-35)

Material Examined

Holotype ♂, Linjiang, Xishui National Natural Reserve (28°19'N, 106°12'E), Guizhou Province, China, 4-VI-2000, X.-S. Chen; paratype: 1 ♀, Xiannvdong, Dashahe Natural Reserve (28°53'N, 107°36'E), Daozhen County, Guizhou Province, 900-1400m, 7-V-2004, X.-S. Chen; 2 ♂♂, Kuankuoshui National Natural Reserve (27°58'N, 107°11'E), Guizhou Province, China, 2-9-VI-2010, P. Zhang (IEGU).

Etymology

The new species is named in honor of Dr. Ai-Ping Liang, a famous taxonomist of fulgoroids from China, and also for his kind help and guidance to the author (X. S. Chen).

Description

Body length (from apex of vertex to tip of forewing): ♂ 4.87-6.30 mm (N = 3), ♀ 6.05 mm (N = 1); forewing length: ♂ 4.21-5.30 mm (N = 3), ♀ 5.20 mm (N = 1).

Coloration. General color (Figs. 33-36) pale brown to brown. Vertex (Figs. 18, 33 and 35) with basal half pale brown, apical half, frons, postclypeus, anteclypeus, antennae and eyes, brown. Genae yellowish brown to pale brown except upper margin of antennae socket dark brown, rostrum yellowish brown, apex brown. Ocelli yellowish brown. Pronotum (Figs. 18, 33 and 35) mostly yellowish brown, but anterior lateral areas in front of lateral carinae brown to dark brown. Mesonotum (Figs. 18, 33 and 35) brown to dark brown, with irregular pale markings. Tegula (Figs. 33 and 35) pale brown. Forewings (Figs. 20, 33 and 34) yellowish brown to pale brown, with irregular stramineous suffusions mainly on apical areas, granules fuscous, setae in granules on veins pale yellowish brown. Hindwings pale fuliginous, veins brown. Thorax ventrally ochraceous, pleurae with fuscous spots. Legs ochraceous with dark brown or fuscous (hind femora much paler), tibiae with wide fuscous rings basally and medially respectively (those on hind tibiae much paler), tarsi and claws brown (hind tarsi and claws much paler), tips of apical spines on hind tibiae and tarsi black. Abdomen with tergites centrally dark brown, poteriorly and laterally yellowish brown, sternites brown to dark brown, lateral areas and posterior and lateral margin yellowish brown. Genital segment yellowish brown to brown.

Head and Thorax. Structural characters as in generic description. Vertex including eyes 0.81 time as wide as pronotum, about 0.51 time as long as wide at base, apex as wide as base. Frons

about 1.17 times longer in median line than wide in widest part. Antennae with scape about 1.64 times longer than wide at apex, pedicel about 2.40 times longer than wide, about 1.57 times longer than scape. Pronotum 0.77 time as long as vertex. Mesonotum 2.05 times longer in middle line than pronotum and vertex combined. Forewing about 2.96 times as long as wide. Hindwings about 1.60 times as long as wide.

Male Genitalia. Pygofer in lateral view (Fig. 23) with posterior margin straight for most of their length, abruptly forming an acute angle at level of genial styles, in ventral view (Fig. 24) with ventral margin strongly broadly excavated with a large median broad triangular process, which very short, distinctly lower than lateral lobes (in one male specimen from Kuankuoshui, the triangular process with a small excavation at apex). Diaphragm (Fig. 25) with upper and lower margins parallel. Aedeagus (Figs. 27 and 28) with flagellum large and long.

Host Plant

Fern (fiddlehead fern, *Pteridum aquilinum* (L.) Kuhn var. '*latiusculum*'; Dennstaedtiales: Dennstaedtiaceae).

Distribution

Southwest China (Guizhou).

Remarks

The new species *Parapunana liangi* is closely related to *Parapunana sinica* (Liang) from southwest (Sichuan), the differences can be seen in the above key.

Parapunana sinica (Liang, 2002) **comb. nov.**

Punana sinica Liang in Liang and Jiang 2002:353.

Material Examined

No specimens of this species were available for this study.

Host Plant

Unknown.

Distribution

Southwest China (Sichuan).

Remarks

The species *sinica* was described by Liang (in Liang & Jiang 2002) within the genus *Punana* Muir based on a single male specimen from Wan County, Sichuan, southwest China. Although the shape of the antenna shown in the illustrations (Liang & Jiang 2002: Figs. 3 and 4) seem to be short and small, but we could find their real size and shape from photos (Liang & Jiang 2002: Figs. 1 and 2), which was similar to that of *liangi* and distinctly different from that of *Punana brunnea* Muir, type species of *Punana* (shown in Asche 1983: Fig. 19b).

We transfer *sinica* from *Punana* to *Parapunana* based on this species having the following diagnostic characters of *Parapunana*: vertex wide and short, broadening toward apex, wider at apex than at base, apical half of submedian carinae very faint, branches of Y-shaped carina each forming an almost straight line; frons wide and rounded, disk longitudinally convex, median carina very faint; antennae with pedicel cylindrical, slightly broadening apically; hindwings with M_3+M_4 forked shallowly, branches distinctly shorter than stalk. *Parapunana* species are different from *Punana* species in that that the vertex is wide and short, broadening toward apex, wider at apex than at base; apical half of submedian carinae very faint; branches of Y-shaped carina each forming an almost straight line; frons wide and rounded, disk longitudinally convex, median carina very faint; antennae with pedicel cylindrical, slightly broadening apically; hindwings with M_3+M_4 forked shallowly, branches distinctly shorter than stalk.

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