



## ***Paralivatiella serrata*, a new genus and new species of Eodelphacini from China, with a redescription of *Prolivatis* Emeljanov (Hemiptera: Fulgoromorpha: Delphacidae)**

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### **Abstract**

*Paralivatiella* **gen. nov.**, is described from China with *P. serrata* **sp. nov.** as the type species. It is placed in the delphacid tribe Eodelphacini of the subfamily Ugyopinae. *Prolivatis gorochovi* Emeljanov is recorded for the first time from China. The latter species is redescribed and illustrated. A checklist of Eodelphacini of the world and a key to all genera of this tribe is also provided.

**Key words:** Ugyopinae, taxonomy, Auchenorrhyncha, planthopper

### **Introduction**

The delphacid tribe Eodelphacini comprising seven genera (*Eodelphax* Kirkaldy 1901, *Ostama* Walker 1857, *Paranda* Melichar 1903, *Melanesia* Kirkaldy 1907, *Punana* Muir 1913, *Livatiella* Fennah 1956 and *Prolivatis* Emeljanov 1995) was established in the subfamily Ugyopinae by Emeljanov (1995). Presently only these seven genera and their 20 species which are confined to the Austro-Oriental Region are known.

Liang and Jiang (2002) studied the tribe Eodelphacini in the Chinese delphacid fauna and only a single species, *Punana sinica* Liang, was recorded by them. In this paper, two more species belonging to two different genera of Eodelphacini are reported from southern China.

### **Material and methods**

Dry pinned and mounted specimens were used for the descriptions and illustrations. External morphology was observed under a stereoscopic microscope and characters were measured with an ocular micrometer. Genital segments of the examined specimens were macerated in 10% NaOH and drawn from preparations in glycerin using a light microscope. Habitus photos were taken by using a Scientific Digital micrography system equipped with an Auto-montage imaging system and a QIMAGING Retiga 4000R digital camera (CCD). Multiple photographs were compressed into final images.

Specimens examined in this study are deposited in the Entomological Museum, Northwest A & F University, Yangling, Shaanxi, China (NWFU). Morphological terminology used in this description follows that of Ding (2006). Body measurements are from apex of vertex to tip of forewing. All measurements are in millimeters (mm).

## Results

### Checklist of Eodelphacini

Eodelphacini Emeljanov, 1995

*Eodelphax* Kirkaldy, 1901

*E. personatus* Fennah, 1977—Vietnam

*E. serendiba* Kirkaldy, 1901—Sri Lanka

*Livatiella* Fennah, 1956

*L. chrysops* Fennah, 1956—Micronesia

*L. constellaris* Fennah, 1956—Micronesia

*Melanesia* Kirkaldy, 1907

*M. borneoensis* Muir, 1913—Borneo

*M. brevipennis* Muir, 1916—Philippines

*M. gisco* Fennah, 1970—Solomon Is.

*M. granulata* (Melichar, 1914)—Philippines

*M. luzonensis* Muir, 1916—Philippines

*M. pacifica* Kirkaldy, 1907—Fiji

*M. similior* Fennah, 1956—Micronesia

*Ostama* Walker, 1857

*O. juncta* Walker, 1857—Borneo

*O. junctissima* Muir, 1926—India

*Paranda* Melichar, 1903

*P. globiceps* Melichar, 1903—Sri Lanka

*Prolivatis* Emeljanov, 1995

*P. gorochovi* Emeljanov, 1995—Southern China (Hainan Prov.) **new record**, Vietnam

*Punana* Muir, 1913

*P. annulata* (Distant, 1916)—India

*P. brunnea* Muir, 1913—Borneo

*P. negrosensis* Muir, 1916—Philippines

*P. philippina* Muir, 1916—Philippines

*P. sinica* Liang, 2002—Southwest China (Sichuan Prov.)

*Paralivatiella* **gen. n.**

*P. serrata* **sp. n.** —Southwest China (Yunnan Prov.)

### Key to genera of Eodelphacini

- 1 Mesonotum with three longitudinal carinae ..... *Ostama* Walker
- Mesonotum with five longitudinal carinae ..... 2
- 2 Hind tibiae with two lateral teeth..... 3
- Hind tibiae with three lateral teeth ..... 4
- 3 Vertex short and broad, anterior margin convex; male pygofer without median process on midventral margin.....  
..... *Paranda* Melichar
- Vertex quadrate, anterior margin transverse; male pygofer with median process on midventral margin .....  
..... *Melanesia* Kirkaldy
- 4 Antennal segments compressed ..... *Eodelphax* Kirkaldy
- Antennal segments cylindrical..... 5
- 5 Sc+R in forewings with two branches before subapical transverse nodal line..... 6
- Sc+R in forewings with one branch before subapical transverse nodal line ..... 7
- 6 Antennal segments distinctly elongate, reaching nearly to apex of postclypeus; male pygofer with lateroventral margins produced in a lanceolate lobe at each side ..... *Prolivatis* Emeljanov
- Antennal segments short, at most reaching frontoclypeal suture; male pygofer with lateroventral margins smooth,

- not produced at each side ..... *Punana* Muir
- 7 Male pygofer with laterodorsal angle not produced, lateroventral margin of pygofer smooth; forewings with Sc+R forked basad of union of claval veins ..... *Paralivatiella* **gen. nov.**
- Male pygofer with laterodorsal angle strongly produced in a spinose process or a finger-like lobe, lateroventral margin of pygofer distinctly produced; forewings with Sc+R forked about the same level with union of claval veins ..... *Livatiella* Fennah

***Paralivatiella* gen. nov.**

**Type species.** *Paralivatiella serrata* **n. sp.** here designated.

**Diagnosis.** Small, brown delphacids. Head longer and narrower than pronotum (Figs 1, 4). Vertex quadrate, slightly broader than long, anterior margin of vertex rounded, projecting in front of eyes (Figs 1, 4), in profile rounded to frons (Figs 2, 5), submedian carinae arising near base of lateral carinae, converging and meeting before apex of vertex, forming isosceles triangle at base of vertex (Figs 1, 4), Y-shaped carina with stem obscure (Figs 1, 4). Median carina of frons simple (Fig. 3). Lateral carinae of pronotum sinuate, not reaching posterior margin (Figs 1, 4). Mesonotum with five carinae (Figs 1, 4). Antennal segments distinctly elongate (Figs 1–3). Forewings with continuous transverse veins and with membrane bent down at rest (Figs 1, 2, 6), with 12 closed apical cells, Sc+R with one branch before subapical transverse nodal line (Fig. 6). Hind tibiae with 3 lateral teeth, metatarsomere I with five apical teeth, metatarsomere II with row of teeth, marginal teeth longer than other teeth. Post tibial spur spine-like, without teeth on inner margin (Fig. 16), Male pygofer strongly excavated ventrocaudally, with small median process on midventral margin (Figs 8–10). Aedeagus 3-segmented, distal segment arched clockwise (Fig. 13). Parameres simple, convergent apically (Figs 8, 15); anal segment without processes, anterior margin strongly excavated inwardly (Figs 8, 17).

**Remarks.** *Paralivatiella* conforms to the tribe Eodelphacini based on the generic characters described by Emeljanov (1995) viz one simple median carina of frons; the distal aedeagal segment arched clockwise (from the base curved to the left when viewed caudally); the presence of 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; the absence of postnodal transverse veins of the forewings; the presence of a well-defined bend of the membrane when the wings are folded and the intermediate carinae of mesonotum straight.

The new genus differs from *Ostama* by the mesonotum having 5 longitudinal carinae (3 in *Ostama*) and forewing having 12 closed apical cells (15 in *Ostama*). It differs from *Melanesia* and *Paranda* by the hind tibiae having 3 lateral teeth (2 in *Melanesia* and *Paranda*). From *Eodelphax* it differs by the antennal segments cylindrical (compressed in *Eodelphax*). From *Punana* and *Prolivatis* it differs by the Sc+R in forewings having one branch before subapical transverse nodal line (two branches in *Punana* and *Prolivatis*), it also differs from *Punana* by the antennal segments distinctly elongate (distinctly short in *Punana*) and from *Prolivatis* by the absence of lanceolate lobes at lateroventral margins of the male pygofer (lanceolate lobes present in *Prolivatis*). The new genus is closest to the genus *Livatiella* in body appearance, but differs from the latter by the lateroventral margins of male pygofer being smooth (distinctly produced in *Livatiella*), laterodorsal angle angulate (strongly produced in a spinose process or a finger-like lobe in *Livatiella*); by the tegmina with Sc+R forked more basad of union of claval veins (about the same level with union of claval veins in *Livatiella*).

**Distribution.** Currently known only from southwest China (Yunnan Province).

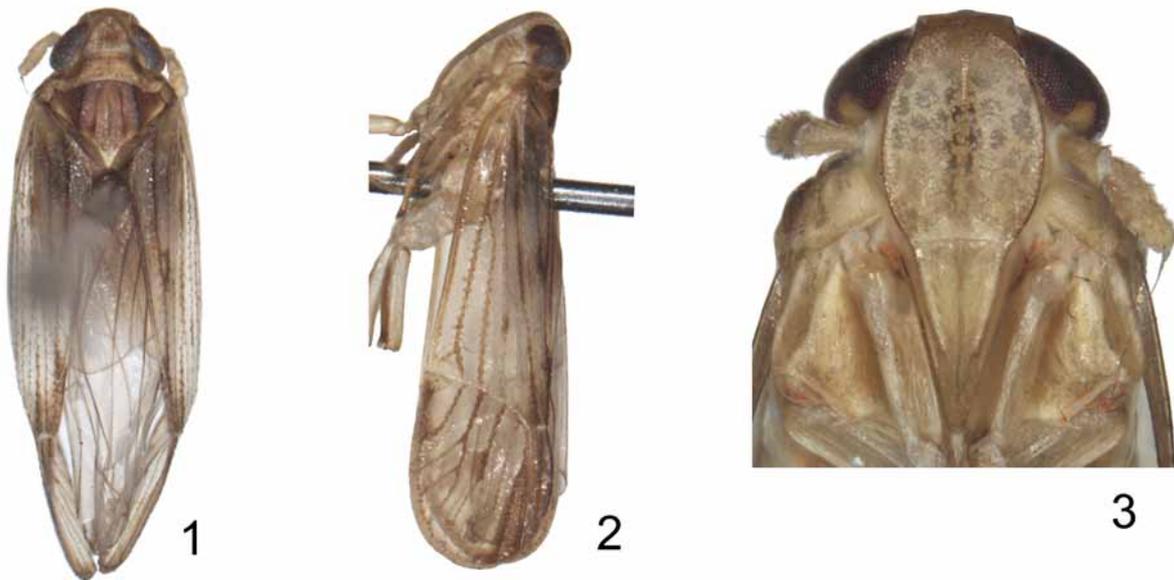
***Paralivatiella serrata* n. sp.**

(Figs 1–17)

**Description.** Body length: male (macropterous, N=3) 3.70–3.74 mm; female (macropterous, N=3) 4.57–4.60 mm.

**Colour.** General color brown. Vertex and frons in basal third brown, frons in apical 2/3, postclypeus, genae and antennae yellow to brownish yellow, frons in apical 2/3 ornamented with irregular hypodermal

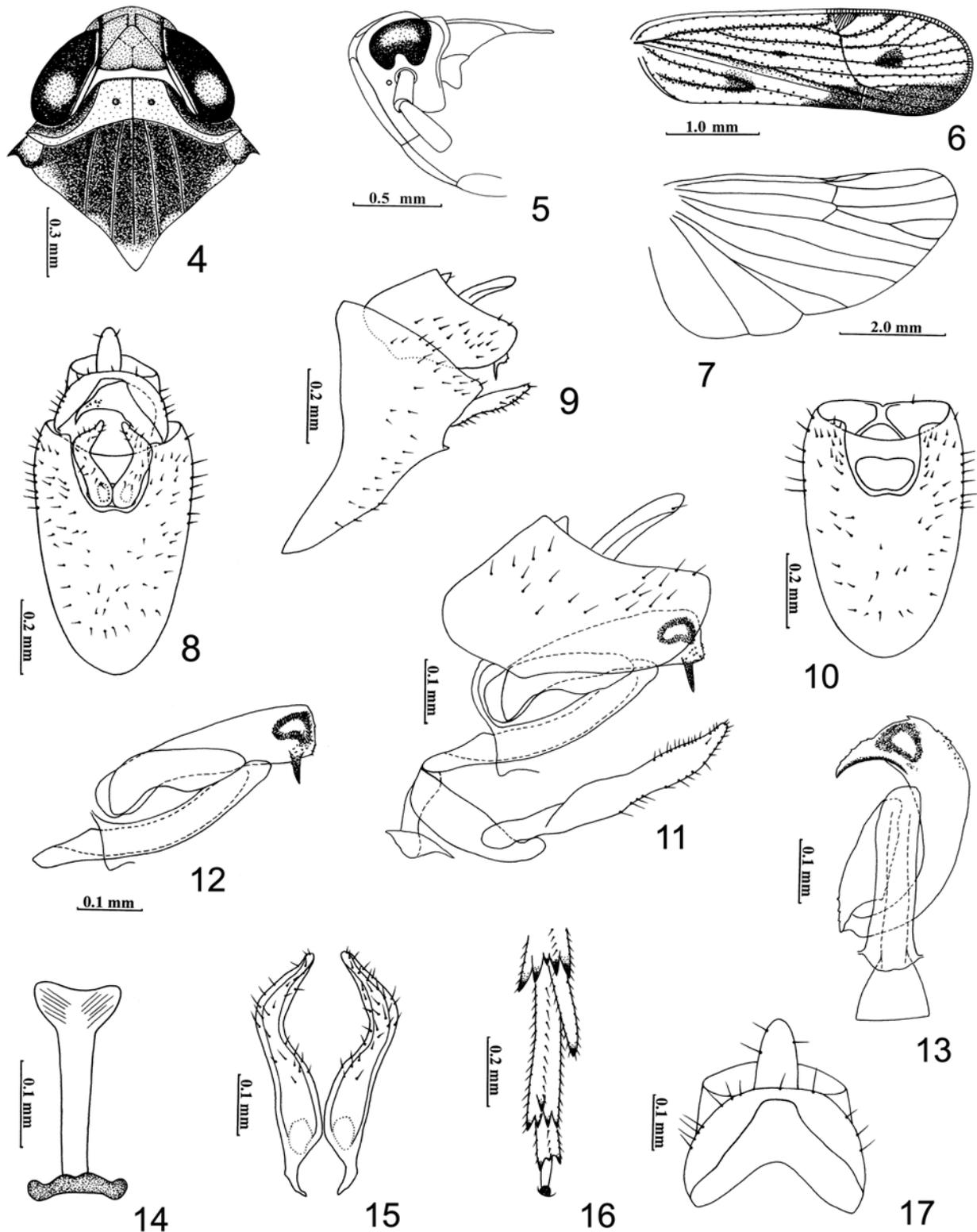
patches. Eyes red with tinge of black. Ocelli yellow. Forewings greyish brown, with brown markings as figured, granules on veins brownish; hind wings pale fuliginous and subhyaline, veins brown. Pronotum sordid yellowish with anterior lateral depressed areas dark brown, in middle with brown to dark brown spot at each side of median carina. Mesonotum laterally dark brown, tip whitish, along posterior margins with 2 pairs of patches, sordid yellowish. Venter of abdomen orange, dorsum of abdomen tawny brown, laterally bordered by broad orange stripe at each side. Legs yellowish brown except hind femora adorned with longitudinal brown stripes, tips of apical teeth on hind tibiae and tarsi black. Female with same color as male except venter of abdomen sordid orange, dorsum of abdomen mostly tawny brown and laterally ornamented with irregular sordid orange patches at each segment. Ovipositor dark brown to black.



**FIGURES 1–3.** *Paralivatiella serrata* n. sp., 1, male adult (abdomen removed), dorsal view; 2, same, left lateral view; 3, head, ventral view.

**Head.** Relatively broad, including eyes slightly narrower than pronotum (about 0.94: 1) (Figs 1, 4). Vertex in dorsal view about 1.20 times wider at base than medially long, nearly of same width at apex as at base, lateral carinae subparallel, posterior margin concave medially (Figs 1, 4), isosceles triangle at base of vertex distinctly depressed; Y-shaped carina faint except common stem ridged posteriorly; two submedian carinae distinctly ridged, anterior lateral areas subquadrangularly depressed laterally (Figs 1, 4); transition from vertex to frons with a symmetrically elevated plane, in frontal aspect distally converging and meeting ridged midline of frons (Fig. 3). Frons medially longer than maximum width (about 1.41: 1), widest at level of antennal bases, nearly as wide at apex as at base, lateral frontal carinae distinctly convex and ridged. Postclypeus of same width as frons at apex, nearly half as long as frons (0.49: 1) and ca. 1.38 times longer than anteclypeus, median carina of ante- and postclypeus ridged, together approximately 0.91x length of frons (Fig. 3), in profile distinctly convex (Figs 2, 5). Rostrum rather long, reaching hind trochanters. Antennal segments cylindrical, distinctly elongate, reaching near apex of postclypeus, segment I about 1.55–1.72 times wider than apical width, narrow at base and apparently broadening to apex, apex distinctly broad, segment II about 2.3 times longer than I (Figs 2, 3).

**Thorax.** Pronotum in dorsal view approximately 0.75x as long as vertex, anterior margin nearly transverse, anterior lateral areas strongly sloping laterad, posterior margin weakly arched inwardly, lateral carinae sinuate, diverging posterolaterally followed by smooth transition nearly parallel with hind margin of eyes, not reaching posterior margin (Figs 1, 4), pronotum width 1.18–1.25 mm (n=6), length 0.23–0.26 mm (n=6). Mesonotum medially ca. in 1.6 times longer than vertex and pronotum together, with five carinae,



**FIGURES 4–17.** *Paralivatiella serrata* n. sp., 4, head and thorax, dorsal view; 5, same, left lateral view; 6, right forewing; 7, right hindwing; 8, male genitalia, caudoventral view; 9, same, left lateral view; 10, male pygofer, caudoventral view, anal segment, aedeagus and parameres removed; 11, anal segment, aedeagus complex and parameres, left lateral view; 12, aedeagus, left lateral view; 13, same, caudoventral view; 14, connective; 15, parameres, caudoventral view; 16, distal end of metatibia and metatarsus; 17, anal segment, caudal view.

median carina straight and obscure distally, others slightly arched laterally, inner pair reaching posterior margins or nearly so, outer pair attaining posterior margins (Figs 1, 4). Forewings relatively narrow and elongate, 4.70–5.07 mm (n=6) long, distinctly surpassing tip of abdomen by nearly half total length, about 3.3 times longer than wide, widest near apex, apically rounded (Figs 2, 6). Legs with hind tibiae 1.65–1.68 mm (n=6) long, bearing three lateral teeth on outer edge, five apical teeth with outer one largest and middle one smallest, metatarsomere I with five apical teeth, four teeth in row, fifth (middle one) displaced more basad, metatarsomere II with three apical teeth (Fig. 16), metatarsomere I (0.57–0.60) slightly longer than tarsomere II (0.21–0.22) + III (0.23–0.25) combined. Post-tibial spur (0.39–0.41) shorter than metabasitarsus, spine-like, without teeth on inner margin (Fig. 16).

**Male genitalia.** Male pygofer in caudoventral view fairly elongate, broad apically, gradually narrowed towards base, ventrocaudal margin strongly excavated with small median process (Figs 8, 10), in lateral view with posterior margin prominently longer than anterior margin, ventral margin sinuate, laterodorsal angle angulate (Fig. 9). Parameres (Figs 8, 9, 11, 15) simple, relatively broad, contiguous at base, then diverging and narrowing apicad in caudoventral aspect, apical 1/3 slightly broadened, directed inwardly, tapered to rounded apices, in lateral view elongate and sinuate at both sides. Aedeagus (Figs 11–13) 3-segmented, second segment with tiny teeth basally at left side in caudoventral view, distal segment arched clockwise (from base curved to left when viewed caudally), subapex expanded and adorned with numerous tiny teeth, apex with distinct subtriangular node, then sharply narrowing, dorsally with several irregular teeth. Anal segment short, broad, without processes, anterior margin strongly excavated inwardly, lateral margins sinuate.

**Material examined.** **Holotype** male (macropterous), **China:** Yunnan Province, Xishuangbanna, Menglun, 19 May 1991, coll. Yinglun Wang & Wanzhi Cai. **Paratypes.** **China:** 1 male (macropterous), same data as holotype; 1 male (macropterous), 24 May 1991, 1 female (macropterous), 26 May 1991, other data as holotype; 2 females (macropterous), **China:** Yunnan Province, Daluo County, 31 May 1991, 650 m, coll. Yinglun Wang & Rungang Tian.

**Etymology.** The species name alludes to the serrated margin of the aedeagus.

**Distribution.** At present known only from the type locality in southern China (Yunnan Province).

### *Prolivatis* Emeljanov

*Prolivatis* Emeljanov, 1995: 781; 1996: 138–139. Type species: *P. gorochovi* Emeljanov, 1995, by original designation.

**Diagnosis.** Small, brown to dark brown delphacids. Vertex quadrate, slightly wider at base than long, anterior margin of vertex rounded, projecting in front of eyes (Figs 18, 21), in profile rounded to frons (Figs 19, 22), submedian carinae originating from near base of lateral carinae, converging and meeting before apex of vertex, forming isosceles triangle at base of vertex (Figs 18, 21), Y-shaped carina with stem faint (Figs 18, 21). Median carinae of frons simple (Fig. 20). Lateral carinae of pronotum sinuate, not reaching posterior margin (Figs 18, 21). Mesonotum with five carinae (Figs 18, 21). Antennal segments distinctly elongate (Figs 18–20). Forewings with more or less continuous transverse veins before apical area, with well-defined bend of the membrane when wings are folded (Figs 18, 19), forewings with 12 closed apical cells, Sc+R with two branches before subapical transverse nodal line (Fig. 23). Post tibial spur spine-like, without teeth on inner margin (Fig. 33), hind tibiae with 3 lateral teeth, metatarsomere I with five apical teeth, metatarsomere II with row of teeth, marginal teeth considerably longer than others. Male pygofer strongly excavated ventrocaudally, with large median process on midventral margin, lateroventral margin with lanceolate lobes (Figs 25–28). Aedeagus 3-segmented, distal segment arched clockwise (Fig. 31). Parameres slender and narrow, convergent apically (Figs 25, 32). Anal segment with anterior margin sinuate, strongly produced at left side (Figs 25, 35).

**Remarks.** *Prolivatis* is similar to *Punana* by the mesonotum having 5 longitudinal carinae, by the hind tibiae having 3 lateral teeth, by the forewings having 12 closed apical cells and by the Sc+R having two branches before subapical transverse nodal line. However, *Prolivatis* differs from *Punana* by its distinctly elongate antennae (reaching near apex of postclypeus, segment II about 2.3 times longer than I) (in *Punana* antennal segments short, at most reaching frontoclypeal suture, segment II a little longer than I); male pygofer

having lanceolate lobe at each side of lateroventral margins (in *Punana* without lanceolate lobes) and laterodistal angle of male anal segment strongly produced at left side (in *Punana* not produced).

**Distribution.** Southern China (Hainan Province) **new record**, Vietnam.

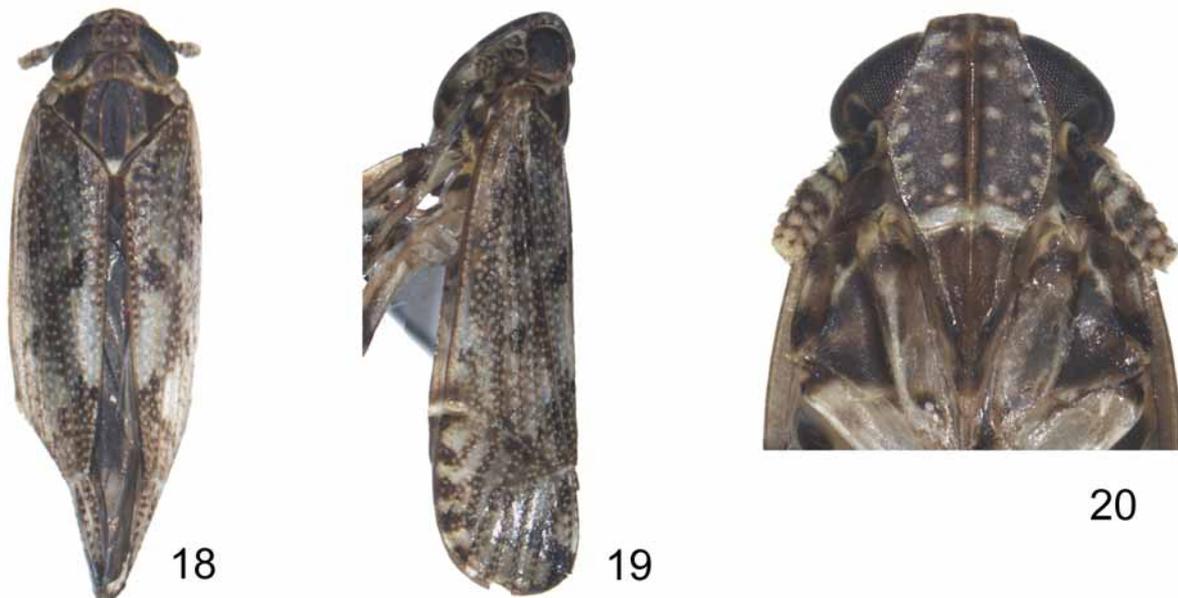
***Prolivatis gorochovi* Emeljanov**

(Figs 18–35)

*Prolivatis gorochovi* Emeljanov, 1995: 781; 1996: 138–139.

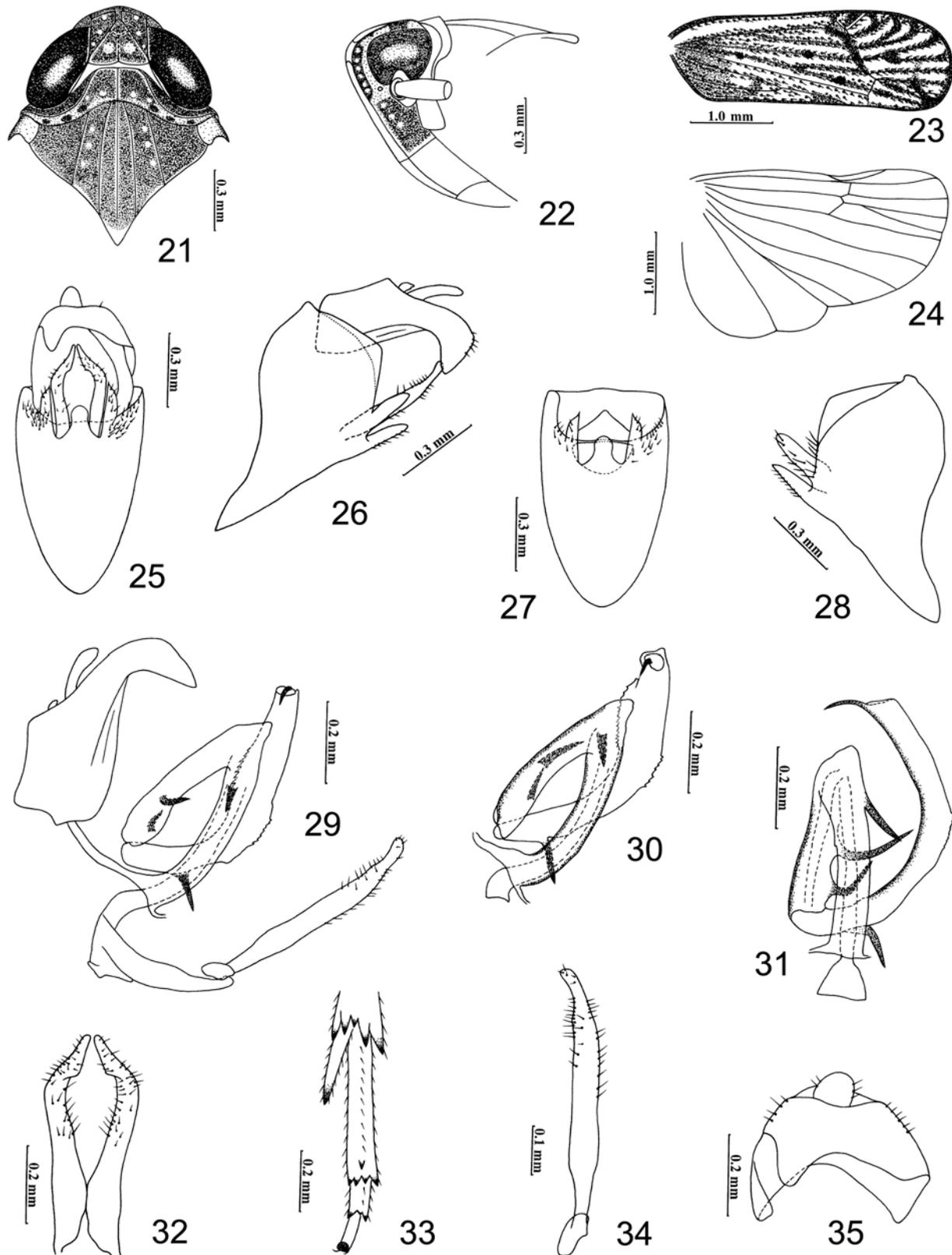
**Description.** Body length: male (macropterous, N=1) 3.75 mm; female (macropterous, N=5) 4.57–4.59 mm.

**Colour.** General color brown. Vertex blackish brown. Frons brown, with light arched transverse stripe at apex. Postclypeus brownish yellow. Eyes black. Ocelli yellowish. Vertex, frons, genae, pronotum and mesonotum with whitish spots. Antennal segment I black basally and apically, segment II with black ring subbasally, apical half black adorned with yellowish brown sensory fields. Forewings brown, with blackish markings as figured, its surface covered with pale granules with long setae accompanied on both sides of longitudinal veins, hind wing pale fuliginous, subhyaline, veins brown. Legs sordid yellowish, ante- and middle tibiae with blackish patches basally and submedially, hind femur blackish brown at apex, hind tibiae with black patches at bases of lateral teeth, tips of apical teeth on hind tibiae and tarsi black. Venter of abdomen yellowish brown, dorsum of abdomen tawny brown with irregular patches laterally at each segment. Female with same color as male except frons and mesonotum blackish brown, postclypeus brown to blackish brown, pronotum with blackish spots along posterior margins. Ante- and middle femur with longitudinal blackish stripes. Venter of abdomen sordid brownish adorned with irregular black patches. Ovipositor black.



**FIGURES 18–20.** *Prolivatis gorochovi* Emeljanov. 18, female adult, dorsal view; 19, same, left lateral view; 20, head, ventral view.

**Head.** Including eyes slightly narrower than pronotum about 0.92: 1 (Figs 18, 21). Vertex in dorsal view about 1.30 times wider than long, nearly as wide at base as apex, lateral carinae subparallel, posterior margin concave medially (Figs 18, 21), isosceles triangle at base of vertex distinctly depressed; Y-shaped carina faint except common stem ridged posteriorly (Figs 18, 21). Median carina of frons simple, basally uniting with convergent apex of the elevated plane, frons in midline longer than wide (about 1.31: 1), widest at level of antennal bases, slightly wider at apex than at base (about 1.12: 1), lateral frontal carinae ridged and distinctly



**FIGURES 21–35.** *Prolivatis gorochovi* Emeljanov. 21, head and thorax, dorsal view; 22, same, left lateral view; 23, right forewing; 24, right hindwing; 25, male genitalia, caudoventral view; 26, same, left lateral view; 27, male pygofer, caudoventral view, anal segment, aedeagus and parameres removed; 28, same, right lateral view; 29, anal segment, aedeagus complex and parameres, left lateral view; 30, aedeagus, left lateral view; 31, same, caudoventral view; 32, parameres, caudoventral view; 33, distal end of metatibia and metatarsus; 34, left paramere, left lateral view; 35, anal segment, caudal view.

convex. Postclypeus with same width as frons at apex, about half as long as frons (about 0.53: 1) and ca. 1.54 times longer than anteclypeus, median carina of post- and anteclypeus apparently ridged, together approximately 0.86x length of frons (Fig. 20), in profile distinctly convex (Figs 19, 22). Rostrum rather long, reaching hind trochanters. Antennal segments cylindrical, elongate, reaching near apex of postclypeus, segment I 1.38–1.41 times wider than apical width, narrow at base and apparently broadening towards apex, apex distinctly broad, segment II about 2.25 times longer than I (Figs 19–20).

**Thorax.** Pronotum in dorsal view approximately 0.71x length of vertex, anterior margin transverse, anterior lateral areas strongly sloping laterad, posterior margin weakly arched inwardly, lateral carinae sinuate, diverging posterolaterally, nearly parallel with hind margin of eyes, not reaching posterior margin (Figs 18, 21), pronotum width 1.16–1.27 mm (n=6), length 0.19–0.26 mm (n=6). Mesonotum medially ca. in 1.85 times longer than vertex and pronotum together, with five carinae, median carina straight, obsolete apically, the inner pair slightly arched laterad, attaining posterior margin, outer pair nearly straight, extending to posterior margin (Figs 18, 21), Tegmina 4.67–4.94 mm long, 2.9 times longer than wide, widest near apex, rounded apically (Figs 19, 23). Legs with ante- and middle femur compressed, hind tibiae 1.53–1.70 mm long, with three lateral teeth on outer edge, five apical teeth with outer one largest, middle one smallest, metatarsomere I with five teeth apically, four spines in row and the fifth (middle one) displaced more basad, metatarsomere II with three apical spines (the middle one minute) (Fig. 33), metatarsomere I (0.50–0.63) slightly longer than tarsomere II (0.20–0.23) + III (0.27–0.30) combined. Posttibial spur (0.37–0.40) shorter than metabasitarsus, spine-like and without teeth on inner margin (Fig. 33).

**Male genitalia.** Male pygofer in caodventral view elongate, strongly expanded apically and gradually narrowed towards base, ventrocaudal margin strongly excavated with large median process, apex rounded (Figs 25, 27), lateroventral margin with lanceolate lobe with tapered prolonged tip at each side (Figs 25–28), lateral margins of male pygofer asymmetrical, the left side protruding angularly while the right side is rounded does not protrude (Figs 26, 28). Parameres fairly slender and narrow, contiguous and divergent from bases, slightly narrowing apicad in caodventral aspect, apical 1/4 slightly broadened, strongly bent mesad, almost meeting at rounded apex (Figs 25, 26, 29, 32, 34). Aedeagus 3-segmented, in caodventral view first segment with spinous process subapically at right side, second with two spinous processes in basal half, distal segment arched clockwise (from base curved to left), with spinous process near base, subapically expanded, with numerous marginal teeth at left side, at right side with teeth in middle portion, apex of aedeagus sharply narrowed and spine-like, gonopore subapical on dorsal surface (Figs 29–31). Anal segment short, broad, in caudal aspect its anterior margin distinctly sinuate and laterodistal angle strongly produced at left side, in profile process bent ventrad (Figs 25, 26, 29, 35).

**Material examined.** 1 male (macropterous), **China:** Hainan Province, Mt. Diaoluo, 10 Apr. 2008, 900 m; 1 female (macropterous), 2 Mar. 2008, 2 females (macropterous), 07 May 2007, 800 m, 1 female (macropterous), 9 May 2008, 800 m, Hainan Province, Jianfengling; 1 female (macropterous), Hainan Province, Tongguling, 24 Apr. 2008, 280 m. All specimens were collected by Qiulei Men.

**Distribution.** Southern China (Hainan Province), Vietnam (Zyalay-Kontum Province).

**Remarks.** The holotype of *P. gorochovi* Emeljanov was collected from Vietnam (Zyalay-Kontum Province) and now it is deposited in the Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia. The *Prolivatis* specimens from Hainan Province match Emeljanov's (1995) description and illustrations of body and male pygofer except the lateral margins of the pygofer are asymmetrical, which differs from specimens studied by Emeljanov (1995) (symmetrical in holotype). We regard this difference to be intraspecific individual variations in *P. gorochovi* and the specimens from southern China are therefore placed in this species.

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