TWO NEW GENERA OF TROPIDOCEPHALINI (HEMIPTERA: FULGOROIDEA: DELPHACIDAE) FROM HAINAN PROVINCE, CHINA

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ABSTRACT

Two new genera of Tropidocephalini (Hemiptera: Fulgoroidea: Delphacidae: Delphacinae) are described from Hainan Province, China. They are *Yuanchia* Chen and Tsai **gen. nov.** and *Neocarinodelphax* Chen and Tsai **gen. nov.** One new species, *Yuanchia maculata* Chen and Tsai **sp. nov.** (China: Hainan: Diaoluoshan) and 1 new combination, *Neocarinodelphax hainanensis* (Qin and Zhang 2005) **comb. nov.** (China: Hainan: Wuzhishan, Tongshi**,** Yancheng) (transferred from *Carinodelphax* Ding and Yang) are described or redescribed and illustrated.

Key Words: Hemiptera, Fulgoroidea, Delphacidae, Tropidocephalini, new genus, new species, new combination, bamboo pests, China

RESUMEN

Se describen dos géneros nuevos de Tropidocephalini (Hemiptera: Fulgoroidea: Delphacidae: Delphacinae) de la Provincia de Hainan de China. Estos son *Yuanchia* Chen y Tsai **gen. nov.** y *Neocarinodelphax* Chen y Tsai **gen. nov.** Se describen y se ilustran una nueva especie, *Yuanchia maculata* Chen y Tsai **sp. nov.** (China: Hainan: Diaoluoshan) y una nueva combinación, *Neocarinodelphax hainanensis* (Qin y Zhang 2005) **comb. nov.** (China: Hainan: Wuzhishan, Tongshi**,** Yancheng) (transferida de *Carinodelphax* Ding y Yang).

The delphacid tribe Tropidocephalini (Hemiptera: Fulgoroidea: Delphacidae: Delphacinae) was erected by Muir (1915) and it is the second largest tribe of Delphacinae. Tribal characters include forewings with R_1 separated from Rs+M basally; hindwings with M stalked with Cu_1 at basal half, anal areas with IA, IIA_1 and IIA_2, all reaching posterior margin; post-tibial spur large and thick, concave on inner surface, without teeth along the hind margin; spinal formula of hind leg 5-6-4; aedeagus often tightly connected with ventral portion of anal segment; complicated asymmetrical distortion in the basal part of the aedeagus with at least one elongated process arising from this part (Asche 1985; Chen 2003; Ding 2006).

Muir (1915) included 6 genera in the Tropidocephalini when he proposed it as a tribe of the Delphacinae, and he included species having a solid post-tibial spur but with a concave inner surface and no teeth along the edge. Asche (1985) increased the number to 21 genera. The tribe Tropidocephalini has now been expanded to include more than 31 genera. Most of species of the tribe feed on bamboo (Bambusoideae) or other grasses (Gramineae). They are mostly Oriental with 26 genera restricted to that region and another 2 shared with the Neotropical region. Two genera are restricted to the Neotropical, 2 to the Palaearctic and 1 to the Australian region. The widespread genus *Tropidocephala* Stål is distributed through the Palaearctic, Afrotropical, Oriental, Australian, and Pacific regions (Donaldson 1991; Chen & Li 2000b; Chen 2003; Ding 2006).

The fauna of Chinese tribe Tripidocephalini is very abundant and 10 new genera were erected in the last 3 decades, as follows: *Bambusiphaga* Huang and Ding (Huang et al. 1979), *Specinervures* Kuoh and Ding (Kuoh et al. 1980), *Paranectopia* Ding and Tian (Ding & Tian 1981), *Neobelocera* Ding and Yang (Ding et al. 1986), *Arcifrons* Ding and Yang (Ding et al. 1986), *Malaxella* Ding and Hu (Ding et al. 1986), *Carinodelphax* Ding and Yang (Ding & Yang 1987), *Carinofrons* Chen and Li (Chen & Li 2000b), *Mirocauda* Chen (Chen 2003) and *Gufacies* Ding (Ding 2006). A key to genera of the tribe Tropidocephalini from China was provided by Chen (2003), who described a new genus. Seventeen genera and 68 species, including 1 new genus, 7 new species, and a revised key were provided in a monograph on the Delphacidae of China (Ding 2006). Recently, the revision

and description of new species of some genera in the tribe Tropidocephalini were also reported (Chen et al. 2006; Chen & Liang 2007; Chen et al. 2007a,b). Most species of Tropidocephalini from China feed exclusively on Bambusoideae (Yang et al. 1999; Chen 2003; Chen et al. 2007a,b; Ding 2006). To date, the Chinese tribe Tropidocephalini has been increased to 18 genera, 3 subgenera and 82 species (Muir 1913, 1915; Fennah 1956; Huang et al. 1979; Kuoh 1979, 1980, Kuoh et al. 1980; Ding & Tian 1981; Ding 1982, 1987, 2006; Ding & Hu 1982, 1991; Ding et al. 1986, 1999; Yang & Yang 1986; Zhu 1988; Yang 1989, 1992; Qin & Yuan 1998, 1999; Chen 1999, 2002, 2003; Chen & Ding 2000; Chen & Li 2000a,b, 2002; Chen et al. 2000, 2006, 2007a,b; Qin & Zhang 2005; Chen & Liang 2007).

In this paper 2 new genera, *Yuanchia* **gen. nov.** and *Neocarinodelphax* **gen. nov.**, 1 new species, *Yuanchia maculata* **sp. nov.**, and 1 new combination, *Neocarinodelphax hainanensis* (Qin and Zhang, 2005) **comb. nov.** (transferred from *Carinodelphax* Ding and Yang) from the Hainan Province, China, are described or redescribed and illustrated.

Materials and Methods

Morphological terminology used in this work 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 with aid of a light microscope. Illustrations of the specimens were made with a 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 examined specimens are deposited in the Insect Collection at the Institute of Entomology, Guizhou University, Guiyang, Guizhou Province, China (IEGU).

Description Taxonomy

Yuanchia Chen and Tsai **gen. nov.** (Figs. 1-11, 21-25)

Type species. Yuanchia maculata Chen and Tsai **sp. nov.**, here designated.

Diagnosis. In profile, dorsum, including vertex, pro- and mesonotum and posterior margin of forewings, in almost the same plane (Fig. 21). Vertex nearly trapeziform, lateral carinae distinctly keeled and slightly converging distad (Figs. 1, 22). Y-carina with stalk absent (present in Fig. 1). Head truncate in lateral view, frons at right angle to the longitudinal axis of body (Figs. 21, 23). Frons rectangular, narrower at base, lateral margins parallel from middle to apex, lateral carinae keeled, median carina forked at extreme base (Figs. 2, 24). Antennae cylindrical, exceeding level of frontoclypeal suture (Figs. 2, 24). Forewing broadening apically, rounded at apex (Figs. 3, 21). Anal segment of male with ventral margin saddle-backed, overlaying base of phallobase and aedeagus (Figs. 8, 9). Pygofer with opening longer than broad (Fig. 6). Genital styles slender, diverging distad (Figs. 6, 10, 11).

Description. Head including eyes narrower than pronotum, vertex trapeziform, with margins well defined. Vertex at base wider than long in middle line, distinctly narrower at apex than at base; submedian carinae originating from near apical 1/4 of lateral carinae, uniting at anterior margin of vertex; lateral carinae distinctly keeled and slightly converging distad (Figs. 1, 22); Y-carina with stalk absent. Head truncate in lateral view, frons at right angle to longitudinal axes of body (Figs. 21, 23). Frons rectangular, narrower at base, lateral margins parallel from middle to apex, lateral carinae keeled, median carina forked at extreme base (Figs. 2, 24), about 3 times longer in middle line than widest part, widest above level of ocelli to apex. Clypeus at base as wide as frons at apex, tricarinate (Figs. 2, 24), in profile with post-clypeus strongly curving caudad (Fig. 23); rostrum almost reaching hind trochanters. Antennae exceeding level of frontoclypeal suture, cylindrical, basal segment slightly widening distad, about 1.5 times as long as wide, second segment about 2 times as long as first (Figs. 2, 24). Pronotum as long as vertex medially, posterior margin concave medially, lateral carinae incurved, reaching to hind margin. Mesonotum about 1.5 times as long as vertex and pronotum together in middle line, median carina discontinuous medially (Figs. 1, 22). Forewings broadening apically, rounded at apex, row of cross veins located in apical half of wing (Figs. 3, 21). Spinal formula of hind leg 5-6-4, post-tibial spur with apical tooth (Fig. 25).

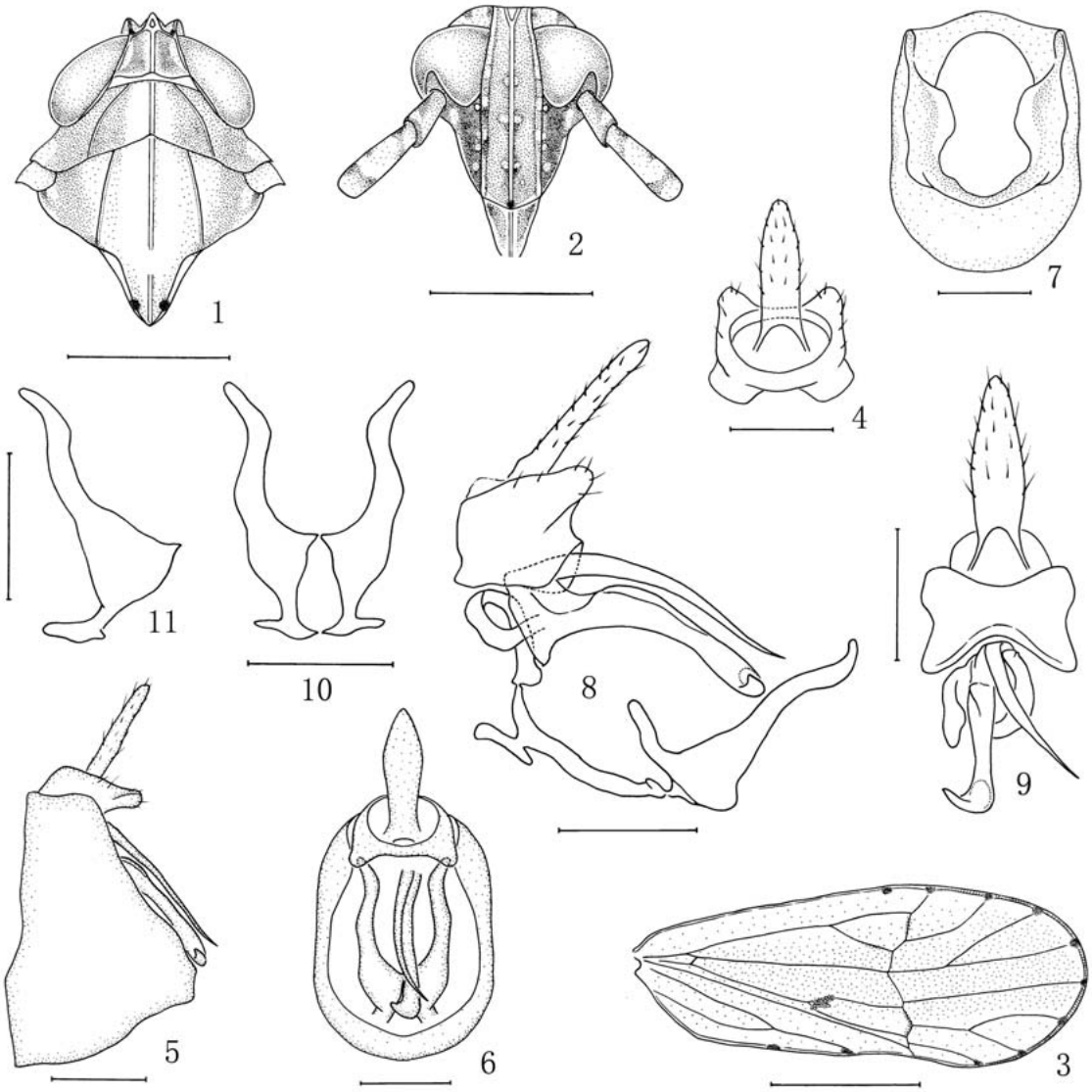
Male Genitalia. Pygofer with opening longer than broad (Fig. 6), in profile much shorter dorsally than ventrally (Fig. 5). Two sides of diaphragm separated from each other (Fig. 7). Aedeagus slender, tubular, phallobasal process arising basally (Fig. 8). Genital styles slender, diverging distad (Figs. 6, 10). Anal segment of male short and ring-like, lateroapical angles separated, each moderately produced ventrad in a rounded lobe (Figs. 4, 8), ventral portion saddle-backed, overlaying base of phallobase and aedeagus (Figs. 4, 8, 9). Anal style long (Figs. 8, 9).

Host Plant. Unknown.

Distribution. Oriental (Indo-Malayian) Region (southern China).

Etymology. The name is derived from transliteration of the Chinese "yuan-chi" meaning the rounded apex of forewings, a feature seldom seen in Tropidocephalini. This genus is feminine in gender.

Remarks. The features of the post-tibial spur and of the male genitalia place this genus in the



Figs. 1-11. *Yuanchia maculata* Chen and Tsai **sp. nov.** 1. Head and thorax, dorsal view; 2. Frons and clypeus; 3. Forewing; 4. Anal segment and anal style, dorsal view; 5. Male genitalia, lateral view; 6. Male genitalia, posterior view; 7. Pygofer, posterior view; 8. Anal style, anal segment, connective and genital style, lateral view; 9. Anal style, anal segment and aedeagus, posterior and ventral view; 10. Genital styles, posterior view; 11. Left genital style, lateral view. Scale bars = 0.5 mm (Figs. 1-2); 1 mm (Fig. 3); 0.2 mm (Figs. 4-11).

Tropidocephalini. It is closely related to the genus *Arcofacies* Muir in the shape of vertex and frons, but differs in: vertex with length in middle line shorter than width of base about 0.79:1.00 (about 0.53-0.59:1.00 in the latter); frons longer in middle line than widest part about 3.25: 1.00 (about 1.75-2.17:1.00 in the latter); frons with median carina forked at extreme base (not forked in the latter); dorsum of body without median longitudinal stripe from apex of vertex to end of scutellum (in the latter, dorsum of body with a narrow stripe along median longitudinal carina of vertex, pro- and mesonotum, which are often white, bordered with brown or fuscous stripe); forewings rounded at apex (acuate at apex in the latter). This new genus is also related to *Carinofrons* Chen and Li, but differs in: vertex distinctly narrower at apex than at base, submedian carinae originating from lateral carinae subapically, uniting at anterior margin of vertex (in the latter, vertex at apex as wide as at base, submedian carinae originating from lateral carinae medially, not uniting at apex

of vertex); frons with lateral margins subparallel from basal 1/3 to apex, median carina forked at extreme base (in the latter, frons with lateral margins convex in middle, median carina forked above the level of ocelli); anal segment of male not sunk into dorsal emargination of pygofer (in the latter, anal segment of male deeply sunk into dorsal emargination of pygofer); sides of diaphragm separated (dorsal margin of diaphragm with armature in the latter).

Yuanchia maculata Chen and Tsai **sp. nov.** (Figs. 1-11, 21-25)

Description. Body length (from apex of vertex to tip of forewing): male 3.50 mm, female 4.05 mm; forewing length: male 2.90 mm, female 3.45 mm.

General color pale yellowish brown (Figs. 21-25). Vertex with median carina and adjacent lateral areas pale yellowish white (Fig. 22). Frons brown with several pale yellowish spots (Fig. 22), lateral carinae brown, median carina pale yellowish brown; apex fuscous. Clypeus yellowish brown, brown at base. Genae fuscous, lateral margins and 3 spots near lateral carinae of frons pale yellowish white (Fig. 24), area above ocelli, between eyes and lateral carinae of frons with 3 brown spots (Fig. 23). Eyes fuscous infused with red, ocelli red. Antennae with segment I brown; II with proximal portions and apex brown (Fig. 24). Pro- and mesonotum with outer areas of lateral carinae, brown, areas between lateral carinae yellowish, median carina yellowish white, lateral margin of scutellum with two fuscous spots (Figs. 1, 22). Forewing yellowish brown to brown, darker apically, 11 fuscous spots distributing along middle of costal margin to nearly middle of posterior margin, a larger fuscous spot on fork of Cu_1 (Figs. 3, 21). Legs pale yellowish brown, darker distad (Figs. 21, 25). Abdomen yellowish ventrally, brown dorsally, lateral areas pale yellowish to yellowish brown, genital segment brown to fuscous.

Structural features as in generic descriptions. Vertex wider at base than long submedially (about 1.27:1.00). Frons longer in middle line than broad at widest part (about 3.25:1.00). Antennae with basal segment 1.60 times as long as wide, second segment 2.13 times as long as first. Mesonotum 1.62 times as long as vertex and pronotum together at middle line. Forewing longer in middle line than broad at widest part (2.59:1.00).

Male Genitalia. Aedeagus moderately long, tubular, thick at base, slender at apex, slightly curving ventrad, apex abruptly bent to left and forming a scoop, tapering apically, orifice dorsally near apex (Figs. 8, 9). Phallobasal process slender, subequal length of aedeagus, arising from base of aedeagus dorsally, directed ventrocaudad and curving to right distad (Figs. 8, 9). Genital styles slender, diverging distad, broader at base, tapering apically, apical half sinuate, apex rounded (Figs. 10, 11). Anal segment of male with lateroapical angles slightly produced ventrocaudad in nipple-like process, separated from each other (Figs. 4, 6).

Host plant. Unknown.

Distribution. South China (Hainan Province).

Specimens Examined. Holotype male, CHINA: Hainan, Diaoluoshan (18°47'N, 109°52'E), 16-VII-2007, Q.-Z. Song; paratype 1 male, same data as holotype; 1 female, Hainan, Jianfengling (18°42'N, 108°47'E), 12-VII-2007, Q.-Z. Song (IEGU).

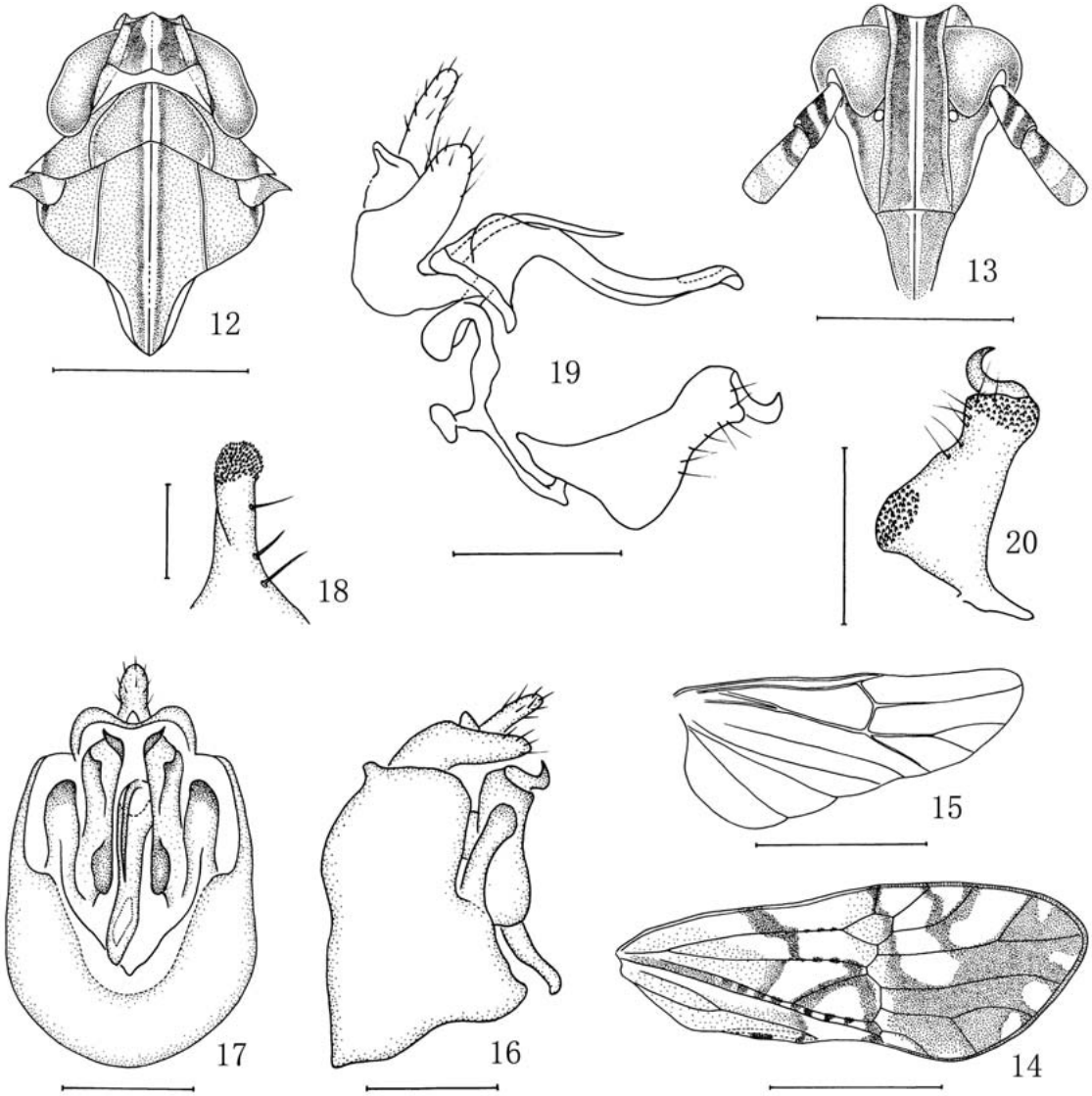
Etymology. The name is derived from the Latin word "macula" (marking) referring to the spots on the scutellum and margin of the forewing.

Neocarinodelphax Chen and Tsai **gen. nov.** (Figs. 12-20, 26-29)

Type species. *Carinodelphax hainanensis* Qin and Zhang, 2005 (here designated).

Diagnosis. Dorsum of body in profile not in the same plane, posterior margin of forewings distinctly keeled (Fig. 26). Vertex trapeziform with a well defined margin, lateral carinae strongly keeled, Y-carina with stalk weak (Figs. 12, 27). Frons in profile at an acute angle to longitudinal axes of body (Figs. 26, 28), subrectangular, widest at apex, lateral carinae distinctly keeled, median carina simple (Figs. 13, 29). Antennae cylindrical, extending to the level of frontoclypeal suture (Figs. 13, 29). Forewings with acute apical angle, outer margin approximately straight, oblique, posterior margin sinuate, with irregular markings at apical half (Figs. 14, 26). Pygofer of male with inner side of each lateral margin having a stout process (Figs. 16, 17).

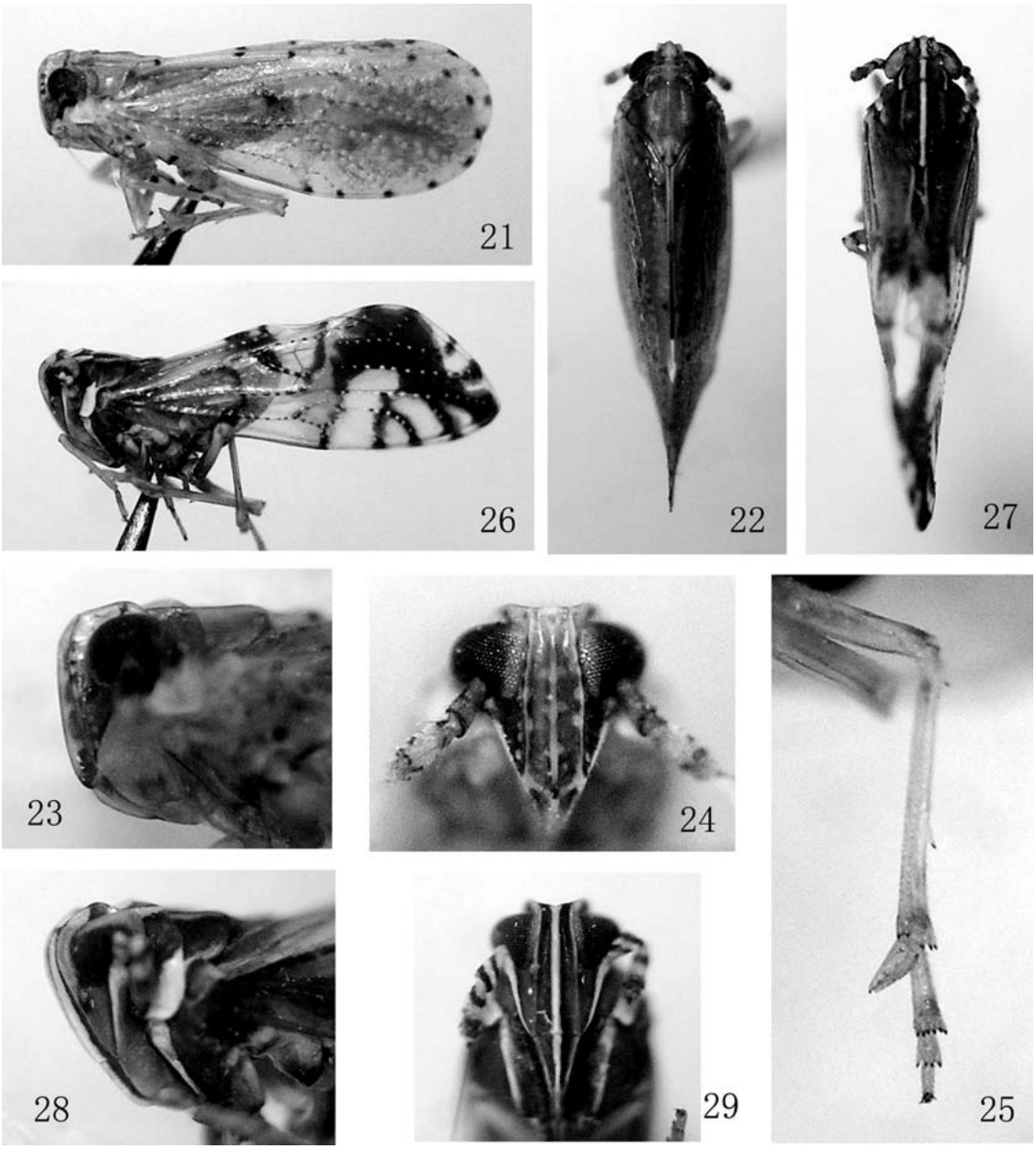
Description. Dorsum of body in profile not in the same plane, posterior margin of forewing distinctly keeled (Fig. 26). Head including eyes narrower than pronotum. Vertex trapeziform, at base wider than long medially (about 1.6:1.0), lateral carinae strongly keeled, diverging caudad, Y-carina with stalk weak, submedian carinae originating from lateral margin subapically, uniting at anterior margin of vertex (Figs. 12, 27). Frons in profile at an acute angle to longitudinal axes of body (Figs. 26, 28), subrectangular, widest at apex, lateral carinae strongly keeled, median carina simple (Figs. 13, 29), longer in middle line than widest about 2.69: 1.00. Clypeus at base slightly wider than frons at apex, tricarinate, in profile with post-clypeus in same plane as frons, ante-clypeus curving caudad (Fig. 28); rostrum nearly reaching posterior trochanters. Antennae cylindrical, extending to frontoclypeal suture, basal segment slightly widening distad, about 1.8 times as long as wide, second segment about 1.5 times as long as first. Pronotum as long as vertex



Figs. 12-20. *Neocarinodelphax hainanensis* (Qin and Zhang) **comb. nov.** 12. Head and thorax, dorsal view; 13. Frons and clypeus; 14. Forewing; 15. Hindwing; 16. Male genitalia, lateral view; 17. Male genitalia, posterior view; 18. Lateral process of pygofer; 19. Anal style, anal segment, aedeagus, connective, and genital style, lateral view; 20. Right genital style, lateral view. Scale bars = 0.5 mm (Figs. 12-13); 1 mm (Fig. 14-15); 0.2 mm (Figs. 16-20).

medially, posterior margin concave medially, tricarinate, developed, lateral carinae recurved, reaching to hind margin. Mesonotum tricarinate, but not distinctly keeled, about 1.8 times as long as vertex and pronotum together in middle line (Figs. 12, 27). Forewings broadening apically, cross veins located in apical half, with apical angle acute, outer margin approximately straight, oblique, posterior margin sinuate, with irregular markings at apical half (Figs. 14, 26). Hindwing subtriangle, $M+Cu_1a$ and Cu_1b with a short common stalk, vein A with 3 branches (Fig. 15). Spinal formula of hind leg 5-6-4, post-tibial spur with apical tooth.

Male Genitalia. Pygofer in profile much shorter dorsally than ventrally, laterodorsal angles obtusely rounded, not produced caudad, lateral margins excavate at middle, each very strongly produced dorsad with medial pillar-like projection (Fig. 16); posterior opening longer than broad, medioventral process absent, ventral margin concave (Fig. 17). Aedeagus slender, tubular; phal-



Figs. 21-29. *Yuanchia maculata* Chen and Tsai **sp. nov.** and *Neocarinodelphax hainanensis* (Qin and Zhang) **comb. nov.** *Yuanchia maculata* (Figs. 21-25) Chen and Tsai **sp. nov.**: 21. Male adult, lateral view; 22. Male adult, dorsal view; 23. Head and thorax, lateral view; 24. Frons and clypeus; 25. Hind leg; Figs. 26-29. *Neocarinodelphax hainanensis* (Qin and Zhang) **comb. nov.**: 26. Female adult, lateral view; 27. Female adult, dorsal view; 28. Head and thorax, lateral view; 29. Frons and clypeus.

lobasal process arising basally (Fig. 19). Genital styles long (Fig. 17). Anal segment of male short and ring-like, lateroapical angles not produced (Figs. 16, 17). Anal style moderately long (Figs. 16, 19).

Host Plant. Unknown.

Distribution. Oriental Region (southern China).

*Etymology***.** The genus name, which is masculine, is a combination of "neo" (new) and "carino-

delphax" (name of the related genus), in recognition of its similarity to the genus *Carinodelphax* Ding and Yang.

Remarks. This genus is related to *Carinodelphax* Ding and Yang, but differs in having frons widest at apex (widest at level of ocelli in the latter); antennae relatively long, reaching the level of the frontoclypeal suture (in the latter, antennae rather short, not reaching frontoclypeal suture); pro- and mesonotum with 3 carinae normal (in the latter, 3 carinae of pro- and mesonotum, especially median carina of scutellum strongly keeled); the color pattern of forewings is also different. This genus resembles *Acrofacies* Muir in color pattern of dorsum and of frons, but differs in having the frons longer in middle line than widest part about 2.69:1.00, widest at apex (in the latter, frons longer in middle line than widest part about 1.75-2.17:1.00, widest at a level of ocelli). In profile, frons at an acute angle to longitudinal axes of body, post-clypeus in the same plane as frons (in the latter, frons at right angle to longitudinal axes of body, post-clypeus strongly curving caudad); forewings relatively long and narrow, longer than broad about 2.69:1.00, costal margin relatively straight (in the latter, forewings relatively short and broad, longer than broad about 2.20-2.26:1.00, costal margin curved); pygofer with an elongated projection at inner side of lateral margin (absent in the latter); aedeagus with long spinose phallobasal process (phallobasal absent or degenerative in the latter).

Neocarinodelphax hainanensis (Qin and Zhang) **comb. nov.** (Figs. 12-20, 26-29)

Carinodelphax hainanensis Qin and Zhang, 2005: 390.

Description. Body length (from apex of vertex to the tip of forewing): male 3.25 mm, female 3.80-3.85 mm; forewing length: male 2.75 mm, female 3.30 mm.

General color brown to fuscous (Figs. 26-29). Median carina of frons and clypeus, lateral margins of genae, pale yellowish white; antennae yellowish brown, middle and apex of basal segment, base of second segment, with blackish bands, apex of second segment brown (Fig. 29). A narrow stripe from apex of vertex to the end of scutellum, a narrow stripe along lateral carinae of pronotum, pale yellowish white, narrowly edged fuscous (Fig. 27); posterior half of lateral areas of pronotum, and propleura, basal half of humeral plate, pale yellowish white (Figs. 12, 26-28). Forewings with irregular hyaline markings (Figs. 14, 26). Abdomen with dorsal and ventral surface, genital segment, yellowish brown to brown; anal segment yellowish brown.

Structural features as in generic descriptions. Vertex wider at base than long submedially (1.60: 1.00). Frons longer in middle line than wide at widest part (2.69: 1.00). Antennae with first segment 1.82 times as long as wide, second segment 1.5 times as long as first. Mesonotum 1.86 times as long as vertex and pronotum together in middle line. Forewing longer in middle line than wide at widest part (2.69:1.00).

Male Genitalia. Anal segment of male with lateroapical angles not produced, conjoined basally to the base of aedeagus (Fig. 19). Pygofer in posterior view with opening longer than wide, ventral margin concave broadly, medioventral process absent; inner side of lateral margin with a very long projection dorsally, apex rounded and with many minute teeth (Figs. 16-18); pygofer with posterior margin medially concave in lateral view (Fig. 16). Aedeagus tubular, slender, sinuate, thick at base, narrowing apically, apex flattened, ventral side of apical half concave, apex margin rounded, orifice dorsally near apex (Fig. 19); phallobasal process long, spinose, tapering distad, arising from base of aedeagus dorsally, slightly decurved, longer than half of aedeagus (Fig. 19). Genital styles thick and long, reaching to ventral margin of anal segment, in posterior view nearly parallel (Fig. 17), in profile broader at base, narrower at apex, apical margin truncate, inner aspect with a hook-like process, inner basal part and apex with minute teeth (Fig. 20).

Host plant. Unknown.

Distribution. South China (Hainan Province).

Specimens examined. 1 male, CHINA: Hainan, Wuzhishan (18°53'N, 109°41'E), 13-VII-2007, lamping, Q.-Z. Song; 1 female, Hainnan, Wuzhishan, 15-VII-2007, Q.-Z. Song; 2 males, 1 female, Hainan, Diaoluoshan (18°47'N, 109°52'E), 16-VII-2007, Q.-Z. Song (IEGU).

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