Review of Chinese species of the leafhopper genus *Scaphoidella* Vilbaste, 1968 (Hemiptera, Cicadellidae, Deltocephalinae), with description of a new species

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**Abstract**

The Chinese leafhopper species of the genus *Scaphoidella* Vilbaste are reviewed, and one new species *Scaphoidella dietrichi* sp. n. is described and illustrated. Two species are recorded from China for the first time: *Scaphoidella clavatella* Dai & Dietrich, 2011 and *Scaphoidella zhangi* (Viraktamath & Mohan, 2004). A key based on the male genitalia is given to distinguish Chinese species of this genus and a map provided their geographic distribution. The type specimens of the new species is deposited in the Institute of Entomology, Guizhou University, Guiyang, China (GUGC).

**Keywords**

Homoptera, morphology, taxonomy, distribution, China
Introduction

The leafhopper genus *Scaphoidella* was established by Vilbaste (1968) for *S. arboricola* Vilbaste from the Maritime Territory of Russia. It belongs to the tribe Scaphoideini of subfamily Deltocephalinae (Zahniser & Dietrich, 2013). Recently, Dai and Dietrich (2011) reviewed this genus and described ten new species from Thailand and Vietnam and at the same time, two new combinations *Scaphoidella zhangi* (Viraktamath & Mohan, 2004), and *S. punctulata* (Melichar, 1903) were proposed (both previously placed in the genus *Scaphoideus*), the species *S. datianensis* Xing, Dai & Li, 2008 was placed in the genus *Monobazus*, and *S. transversa* Li & Xing, 2009 was excluded from *Scaphoidella* and treated as a species incertae sedis. The species *S. denticlestyla* Xing & Li, 2010 (see Chen, Li and Jin 2010) and *S. brevissima* Dai, Xing & Li (2011) in *Scaphoidella* (not listed in the checklist of Dai and Dietrich (2011)) are discussed below, bringing the total of known species to 20, including eight from China.

In this paper, a new species: *Scaphoidella dietrichi* sp. n. is described and illustrated from Yunnan Province, China, and *S. clavatella* Dai & Dietrich, 2011 and *S. zhangi* (Viraktamath & Mohan, 2004) are recorded from China for the first time. The type specimens of the new species is deposited in the Institute of Entomology, Guizhou University, Guiyang, China (GUGC). The genus *Scaphoidella* now contains 21 species including 11 from China. A key is given to separate the Chinese species.

Material and methods

Terminology of morphological and genital characters follow Zhang and Dai (2006) and Dai and Dietrich (2011). Male specimens were used for the description and illustration. External morphology was observed under a stereoscopic microscope and characters were measured with an ocular micrometer. Color pictures for adult habitus were obtained by KEYENCE VHX-1000 system. The genital segments of the examined specimens were macerated in 10% NaOH and drawn from preparations in glycerin jelly using a Leica MZ 12.5 stereomicroscope. Illustrations were scanned with Canon CanoScan LiDE 200 and imported into Adobe Photoshop 8 for labeling and plate composition.

Taxonomy

*Scaphoidella* Vilbaste

*Scaphoidella* Vilbaste, 1968: 133; Zhang and Dai 2006: 841; Li, Dai and Xing 2011: 199; Dai and Dietrich 2011: 458.

**Type species.** *Scaphoidella arboricola* Vilbaste, 1968.

For the relationship and diagnosis of *Scaphoidella* Vilbaste see Dai and Dietrich (2011: 458).
Distribution. Oriental Region and Palaeartic Region (see Discussion).

Checklist of species of *Scaphoidella*

*S. acaudata* Zhang & Dai, 2006 Distribution: China (Yunnan, Guizhou).
*S. arboricola* Vilbaste, 1968 Distribution: Russia (Maritime Territory); China (Zhejiang, Henan).
*S. bifurcata* Dai & Dietrich, 2011 Distribution: Thailand (Chaiyaphum, Ubon Ratchathani, Phetchabun).
*S. brevissima* Dai, Xing & Li, 2011 Distribution: China (Henan).
*S. clavatella* Dai & Dietrich, 2011 Distribution: Thailand (Loei); China (Guangxi, Yunnan).
*S. cornuta* Dai & Dietrich, 2011 Distribution: Thailand (Loei, Phetchabun).
*S. coronoida* Dai & Dietrich, 2011 Distribution: Thailand (Chiang Mai, Loei).
*S. denticlestyla* Xing & Li, 2010 Distribution: China (Guizhou).
*S. dietrichi* Xing & Li, sp. n. Distribution: China (Yunnan).
*S. digitatus* Dai & Dietrich, 2011 Distribution: Thailand (Ubon Ratchathani, Khon-kaen).
*S. dimidiatus* Dai & Dietrich, 2011 Distribution: Thailand (Chaiyaphum, Loei, Phetchabun).
*S. dongnaiensis* Dai & Dietrich, 2011 Distribution: Vietnam (Dongnai).
*S. flangenella* Dai & Dietrich, 2011 Distribution: Thailand (Ubon Ratchathani). 
*S. lamella* Dai & Dietrich, 2011 Distribution: Thailand (Loei, Phetchabun, Phitsanulok, Sakon Nakhon, Ubon Ratchathani).
*S. punctulata* (Melichar, 1903) Distribution: Sri Lanka.
*S. stenopaea* Anufriev, 1977 Distribution: Russia (Amur Province, Maritime Territory); China (Shaanxi, Shandong, Heilongjiang, Liaoning, Gansu, Inner Mongolia, Hebei, Shanxi).
*S. undosa* Zhang & Dai, 2006 Distribution: China (Henan, Hunan, Jiangxi, Hubei, Guizhou, Zhejiang, Anhui).
*S. unihamata* (Li & Kuoh, 1993) Distribution: China (Zhejiang, Hunan, Fujian, Guangxi).
*S. viraktamathi* Dai & Dietrich, 2011 Distribution: Thailand (Phetchabun, Sakon Nakhon).
*S. wideadeaga* (Wang & Li, 2004) Distribution: China (Yunnan, Xizang); Thailand (Loei).
*S. zhangi* (Viraktamath & Mohan, 2004) Distribution: India (Meghalaya, West Bengal); Thailand (Loei); China (Guizhou).

Key to species (males) of *Scaphoidella* from China

1 Pygofer side with conspicuous spine on dorsal margin (Figs 19, 37)............2
   – Pygofer side without spine on dorsal margin ........................................3
2 Pygofer side with caudal margin round, without spine (Fig. 19) ....... *S. clavatella*
Pygofer side with ventrally directed spine on caudal margin (Fig. 37) ... \textit{S. zhangi}

3 Subgenital plate with lateral macrosetae arranged irregularly (Zhang and Dai 2006: Figs 5, 15) .......................................................................................... 4

– Subgenital plate with lateral macrosetae in single row ........................................ 5

4 Pygofer process long; subgenital plate tapered apically; basal processes of aedeagus extending to near apex of shaft (Zhang and Dai 2006: Figs 4–6) .... \textit{S. undosa}

– Pygofer process short; subgenital plate rounded apically; basal processes of aedeagus extending beyond shaft (Zhang and Dai 2006: Figs 14–16) .... \textit{S. arboricola}

5 Pygofer side with caudal process (Fig. 13; Zhang and Dai 2006: Figs 33, 44) ... 6

– Pygofer side without caudal process ................................................................... 8

6 Apex of aedeagal shaft with pair of lateral processes; preatrium short (Zhang and Dai 2006: Figs 28, 29) ................................................................. \textit{S. stenopaea}

– Apex of aedeagal shaft without processes; preatrium very long (Fig. 17; Zhang and Dai 2006: Fig. 37) ............................................................. 7

7 Style apical process moderately long (Fig. 18) ................................ \textit{S. brevissima}

– Style apical process very long (Zhang and Dai 2006: Fig. 39) ... \textit{S. unihamata}

8 Apical margin of aedeagal shaft with many small spines on both sides (Figs 34, 35) ................................................................. \textit{S. dietrichi} sp. n.

– Aedeagal shaft without small spinose processes ........................................... 9

9 Aedeagal shaft in lateral view distinctly broadened near midlength; stem of connective nearly 1/3 length of arms (Zhang and Dai 2006: Figs 47, 50) .... ................................................................. \textit{S. wideaedeaga}

– Aedeagal shaft in lateral view slender and not broadened near midlength; stem of connective and arms of approximately equal length (Figs 28, 29; Zhang and Dai 2006: Figs 57,58) ...................................................... 10

10 Preatrium of aedeagus very long; style apical process with teeth (Figs 29, 30) ... ................................................................. \textit{S. denticlestyla}

– Preatrium of aedeagus short; style apical process without teeth (Zhang and Dai 2006: Figs 55, 57) ................................................................. \textit{S. acaudata}

\textbf{Chinese \textit{Scaphoidella} species}

\textit{Scaphoidella acaudata} Zhang & Dai, 2006

\textit{Scaphoidella acaudata} Zhang & Dai, 2006: 850, figs 51–58; Li, Dai and Xing 2011: 199, plate 5–194, figs 1–6.

\textbf{Material examined.} 1♂, China: Guizhou Prov., Bailidujuan, 18 October 2007, coll. Yujian Li (GUGC); 1♂, Yunnan Prov., Longling, Longxin, 10 June 2011, coll. Ji-ankun Long (GUGC).

\textbf{Distribution.} China (Yunnan, Guizhou) (Fig. 43).
Scaphoidella arboricola Vilbaste, 1968

*Scaphoidella arboricola* Vilbaste, 1968: 133, plate 110, figs 1–8; Zhang and Dai 2006: 850, figs 1–10.

**Distribution.** Russia (Maritime Territory); China (Zhejiang, Henan) (Fig. 43).

Scaphoidella brevissima Dai, Xing & Li, 2011

Figs 1–2, 13–18

*Scaphoidella brevissima* Dai, Xing & Li, 2011: 1, figs 1–10.

**Material examined.** China: 1♂ (Holotype), Henan Prov., Luanchuan County, Heyu, 19 August 2008, coll. Jichun Xing (GUGC); 1♂, Henan Prov., Xixia County, Taiping, 30 July 2010, coll. Hu Li and Zhihua Fang (GUGC).

**Distribution.** China (Henan) (Fig. 43).

**Note.** This species was described from China (Henan) based on the male holotype (GUGC).

Scaphoidella clavatella Dai & Dietrich, 2011

Figs 3–4, 19–24

*Scaphoidella clavatella* Dai & Dietrich, 2011: 468, figs 51–55.

**Material examined.** 1♂, China: Guangxi Autonomous Region, Daxin County, De-tianpubu, 11 May 2012, coll. Zhihua Fan (GUGC); 1♂1♀, Yunnan Prov., Menghai, 13 July 2013, coll. Jichun Xing (GUGC).

**Distribution.** Thailand (Loei); China (Guangxi, Yunnan) (Fig. 43).

**Note.** This species was described from Thailand (Loei) based on two male specimens (QSBG and INHS). This species is here recorded from China for the first time.

Scaphoidella denticlastyla Xing & Li, 2010

Figs 5–6, 25–30

*Scaphoidella denticlastyla* Xing & Li (in Chen et al.), 2010: 138, Figs 7–14; Li, Dai and Xing 2011: 200, plate 5–195, figs 1–8.

**Material examined.** China: 1♂ (Holotype), Guizhou Prov., Mayanghe, Maojia, 5 October 2007, coll. Yujian Li (GUGC); 1♂, Guizhou Prov., Mayanghe, Maojia, 6 October 2007, coll. Qiongzhang Song (GUGC).
Figures 1–8. Scaphoidella species. 1, 2 Scaphoidella brevissima Dai, Xing & Li 1 ♂, dorsal view 2 ♂, lateral view 3, 4 Scaphoidella clavatella Dai & Dietrich 3 ♂, dorsal view 4 ♂, lateral view 5, 6 Scaphoidella denticestyla Xing & Li 5 ♂, dorsal view 6 ♂, lateral view 7, 8 Scaphoidella zhangi (Viraktamath & Mohan) 7 ♂, dorsal view 8 ♂, lateral view.
Distribution. China (Guizhou) (Fig. 43).

Note. This species was described from China (Guizhou) based on two male specimens deposited in GUGC. As the original figures of Xing & Li (in Chen et al. 2010 and Li et al. 2011) are not very perfect the male genitalia are redrawn here by the first author.

*Scaphoidella dietrichi* Xing & Li, sp. n.
http://zoobank.org/414D9E83-6DF9-4F74-BECC-55886B131911
Figs 9–12, 31–36

**Description.** Body ochraceous. Head with piceous submarginal band on anterior margin, one transverse arcuate band between eyes anteriorly, narrowly margined with piceous, orange red (Figs 9, 11). Face with thin, arcuate, piceous submarginal band (Fig. 12). Pronotum with anterior brown and posterior submarginal chocolate brown transverse bands (Fig. 11). Forewing ochraceous, with hyaline spots (Figs 9, 10).

Vertex shorter than pronotum, shorter medially than next to eye. Pronotum longer than scutellum (Fig. 11). External features as in generic description (see Dai and Dietrich 2011: 458).

*Figures 9–12. Scaphoidella dietrichi* sp. n., ♂. 9 dorsal view 10 lateral view 11 head and thorax, dorsal view 12 face.
Male genitalia. Pygofer in lateral aspect tapering posteriorly from midlength, with many short and long macrosetae dorsally, without caudal process (Fig. 31). Valve large, subtriangular (Fig. 32). Subgenital plate elongate, narrowing to rounded apex, uniseriate row of macrosetae along ventrolateral margin and additional hair-like setae at apex (Fig. 33). Aedeagal shaft curved dorsally, its apical margin with many small spines on both sides, gonopore apical, preatrium very long; basal processes slender, tapering apically, extended to near apex of aedeagal shaft (Figs 34, 35). Connective Y-shaped, articulated with aedeagus, its stem nearly 1/3 length of arms (Fig. 34). Style elongate, with prominent subapical lobe, apophysis slender and narrowed distally, equal to 1/2 length of style (Fig. 36).
Figures 19–24. *Scaphoidella clavatella* Dai & Dietrich, 19 Male pygofer side, lateral view 20 Valve, ventral view 21 Subgenital plates, ventral view 22 Aedeagus and connective, ventral view 23 Aedeagus and connective, lateral view 24 Style, dorsal view.

**Measurement.** Length (including tegmen): ♂, 4.4 mm.

**Type material.** Holotype ♂, China: Yunnan Prov., Xishuangbanna, Menglun, 28 July 2012, coll. Weibin Zheng (GUGC).

**Host.** Grasses.

**Distribution.** China (Yunnan) (Fig. 43).

**Diagnosis.** This species is similar to *Scaphoidella zhangi* (Viraktamath & Mohan, 2004), but can be distinguished from the latter by the male pygofer without caudal process and spine on dorsal margin, apical margin of aedeagal shaft with many small spinose processes on both sides, and aedeagal shaft curved dorsally.
Figures 25–30. *Scaphoidella denticulata* Xing & Li, 25 Male pygofer side, lateral view 26 Valve, ventral view 27 Subgenital plates, ventral view 28 Aedeagus and connective, ventral view 29 Aedeagus and connective, lateral view 30 Style, dorsal view.

**Etymology.** This new species is named after Dr. C. H. Dietrich (INHS) in recognition of his good work on leafhoppers.

*Scaphoidella stenopaea* Anufriev, 1977

*Scaphoidella stenopaea* Anufriev, 1977: 213, figs 13–19; Zhang and Dai 2006: 847, figs 23–29; Li, Dai and Xing 2011: 201, plate 5-196, figs 1–6.
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**Figures 31–36. Scaphoidella dietrichi** sp. n., 31 Male pygofer side, lateral view 32 Valve, ventral view 33 Subgenital plates, ventral view 34 Aedeagus and connective, ventral view 35 Aedeagus and connective, lateral view 36 Style, dorsal view.

**Material examined.** 3♂♂4♀♀, China: Inner Mongolia Autonomous Region, Zhalantun, 26 August 1996, coll. Zizhong Li; 2♂♂3♀♀, Gansu Prov., Zhenyuan, 1 August 2007, coll. Wei Cao; 4♂♂2♀♀, Hebei Prov., Chengde, Wulingshan, 14 August 2010, coll. Lixia Xie; 2♂♂, Shanxi Prov., Lishan, Dahelinchang, 23 July 2012, coll. Jichun Xing. All GUGC.

**Distribution.** Russia (Amur Province, Maritime Territory); China (Shaanxi, Shandong, Heilongjiang, Liaoning, Gansu, Inner Mongolia, Hebei, Shanxi) (Fig. 43).
Scaphoidella undosa Zhang & Dai, 2006

*Scaphoidella undosa* Zhang & Dai, 2006: 844, figs 11–22; Li, Dai and Xing 2011: 204, plate 5-199, figs 1–7.

**Material examined.** 1♂2♀, China: Guizhou Prov., Kuankuoshui, 24 August 2001, coll. Zizhong Li; 1♂, Guizhou Prov., Congjiang County, Yueliangshan, 20 July 2006, coll. Zaihua Yang; 1♂1♀, Zhejiang Prov., Tianmushan, 22 July 2009, light trap coll. Zehong Meng; 1♂, Guizhou Prov., Kuankuoshui, 11 August 2010, coll. Hu Li; 2♂1♀, Guizhou Prov., Kuankuoshui, 14 August 2010, coll. Jichun Xing; 2♂♂, Guizhou Prov., Kuankuoshui, 17 August 2010, coll. Hu Li and Zhihua Fan; 2♂♂, Anhui Prov., Jinzhai County, Tianma, 31 July 2013, coll. Bin Li. All GUGC.

**Distribution.** China (Henan, Hunan, Jiangxi, Hubei, Guizhou, Zhejiang, Anhui) (Fig. 43).

Scaphoidella unihamata (Li & Kuoh, 1993)

*Scaphoideus unihamatus* Li & Kuoh, 1993: 39, figs 7–12.
*Scaphoidella inermis* Cai & He, 2001: 205, figs 89–96, synonymised by Zhang and Dai 2006: 848.

*Scaphoidella unihamata* (Li & Kuoh), comb. n. by Zhang and Dai 2006: 848, figs 30–40; Li, Dai and Xing 2011: 203, plate 5–198, figs 1–5.

**Material examined.** China: 1♂ (Holotype), Fujian Prov., Sanming, 6 September 1978, coll. Zhonglin Ge; 2♂♂, Fujian Prov., Sanming, 6 September 1978, coll. Zhonglin Ge; 1♂, Guangxi Autonomous Region, Huaping, 19 May 2012, coll. Zhihua Fan. All GUGC.

**Distribution.** China (Zhejiang, Hunan, Fujian, Guangxi) (Fig. 43).

Scaphoidella wideaedeaga (Wang & Li, 2004)

*Scaphoideus wideaedeagus* Wang & Li, 2004: 17, figs 14–19.
*Scaphoidella wideaedeaga* (Wang & Li), comb. n. by Zhang and Dai 2006: 849, figs 41–50; Li, Dai and Xing 2011: 205, plate 5-200, figs 1–6; Dai and Dietrich 2011: 472.

**Material examined.** China: 1♂ (Holotype), Yunnan Prov., Tengchong, 4 July 2002, coll. Renhuaie Dai; 1♂1♀, Yunnan Prov., Gaoligongshan, Baihuling, 14 June 2011, coll. Yujian Li; 1♂, Yunnan Prov., Ruili City, Nongdao, 15 July 2013, coll. Weicheng Yang; 1♂, Yunnan Prov., Gaoligongshan, Baihuling, 5 August 2013, coll. Zhihua Fan. All GUGC.

**Distribution.** China (Yunnan, Xizang) (Fig. 43), Thailand (Loei).
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Figures 37–42. Scaphoidella zhangi (Viraktamath & Mohan), 37 Male pygofer side, lateral view 38 Valve, ventral view 39 Subgenital plates, ventral view 40 Aedeagus and connective, ventral view 41 Aedeagus and connective, lateral view 42 Style, dorsal view.

Scaphoidella zhangi (Viraktamath & Mohan, 2004)
Figs 7–8, 37–42

Scaphoideus zhangi Viraktamath & Mohan, 2004: 45, figs 218–227. Scaphoidella zhangi comb. n. by Dai and Dietrich 2011: 471.

Material examined. 1♂, China: Guizhou Prov., Luodian County, Bamao, 20 October 2002, coll. Renhuai Dai (GUGC).

Distribution. India (Meghalaya, West Bengal); Thailand (Loei); China (Guizhou) (Fig. 43).

Note. This species is here recorded from China for the first time.
Discussion

Chinese species of *Scaphoidella* are mainly distributed in southern China (*S. acaudata, S. clavatella, S. denticlestyla, S. dietrichi, S. unihamata,* and *S. zhangi*) with *S. brevissima* and *S. stenopaea* distributed in the Palaearctic Region (northern China and also Inner Mongolia). The following Chinese species occur in both regions: *S. arboricola, S. undosa,* and *S. wideaedeaga.* Until now, six species: *S. acaudata, S. brevissima, S. denticlestyla, S. dietrichi, S. undosa,* and *S. unihamata* are endemic to China and *S. stenopaea, S. undosa,* and *S. unihamata* appear to be widespread. It is highly likely that there are undiscovered species in China.

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