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Two new species of *Sinacroneuria* Yang & Yang, 1995 (Plecoptera: Perlidae) from China

Rui-Jun LIU¹  , Zhi-Shan CAO²   & Wei-Hai LI^{3,*}  

^{1,2,3}Henan International Joint Laboratory of Taxonomy and Systematic Evolution of Insecta,
Henan Institute of Science and Technology, Xinxiang, Henan 453003, China.

*Corresponding author: lwh7969@163.com

¹Email: histruijun@163.com

²Email: caozhishan123@163.com

¹[urn:lsid:zoobank.org:author:1C00450A-AAE4-4F41-8E9D-11FB7A1E05FE](https://zoobank.org/urn:lsid:zoobank.org:author:1C00450A-AAE4-4F41-8E9D-11FB7A1E05FE)

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Abstract. Two new species of the stonefly genus *Sinacroneuria*, *S. aequalis* sp. nov. and *S. transversa* sp. nov., are described and illustrated from the Fujian and Zhejiang provinces of China. These new taxa are compared with related congeners. A distribution map of the genus is also presented.

Keywords. China, Perlidae, Plecoptera, *Sinacroneuria*, stoneflies, new species.

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Introduction

Sinacroneuria was established by Yang & Yang (1995) in the subfamily Acroneuriinae Klapálek, 1914 to accommodate *Sinacroneuria orientalis* Yang & Yang, 1995. Currently, it includes 18 species recognized worldwide (DeWalt *et al.* 2023; Xiang *et al.* 2022), of which 16 species are distributed in China, one in Japan and one in Vietnam (Table 1). Among them, *S. longwangshana* (Yang & Yang, 1998), *S. quadriplagiata* (Wu, 1938), *S. sinica* (Yang & Yang, 1998), and *S. wui* (Yang & Yang, 1998) were originally included in the genus *Acroneuria* Pictet, 1841 but have now been transferred to the *Sinacroneuria*. Additionally, *S. yiui* (Wu, 1935) was firstly proposed in *Mesoperla* Klapálek, 1913 and later transferred to the *Acroneuria*, and subsequently moved to the *Sinacroneuria* (Wu, 1938). In the present paper, two new species of *Sinacroneuria*, *S. aequalis* sp. nov. and *S. transversa* sp. nov., are described based on specimens collected from Fujian and Zhejiang provinces of southeastern China.

Material and methods

The specimens used in this study were collected using light traps and stored in 75% ethanol. Specimens were examined under a Leica M420 dissecting microscope. The color photographs were made with the aid of Imaging Source CCD attached to a Leica M205FA dissecting microscope. All photos were optimized and processed using Adobe Photoshop CC (64 Bit) 2019. All specimens are deposited in the Entomological Museum of China Agricultural University (CAU) and in the Henan Institute of Science and Technology, Xinxiang (HIST). Terminology follows that of Huo & Du (2020) and Sivec & Stark (2020). The maps were downloaded from Standard Map Service (<https://bzdt.ch.mnr.gov.cn/>). The map number is GS (2019) 1823.

Abbreviations for morphological terms used in figures

hm = hammer
ls = lateral sclerite
ms = median sclerite
pp = paraproct
sbp = sensilla basiconica patch
S8 = sternum 8
S9 = sternum 9
T9 = tergum 9
T10 = tergum 10
Ya = Y-arms
Ys = Y-stem

Results

Taxonomy

Class Insecta Linnaeus, 1758
Order Plecoptera Burmeister, 1839
Family Perlidae Latreille, 1802
Subfamily Acroneuriinae Klapálek, 1914
Genus *Sinacroneuria* Yang & Yang, 1995

Sinacroneuria Yang & Yang, 1995: 1.

Type species

Sinacroneuria orientalis Yang & Yang, 1995.

Diagnosis

Middle sized. Macropterous. General body color brown or yellowish brown. Triocellate, anterior ocellus smaller. Male terga 9–10 with median sensilla basiconica patches. Paraprocts broad basally, heavily reflexed inward and forward. Aedeagal sclerite Y-shaped.

Sinacroneuria aequalis sp. nov.

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Figs 1–3, 6; Table 1

Diagnosis

Tergum 9 with subrectangular sensilla basiconica patch. Aedeagus mostly membranous, Y-arm and Y-stem subequal in length. Ventral median sclerite long and filiform, fully covered with short spines.

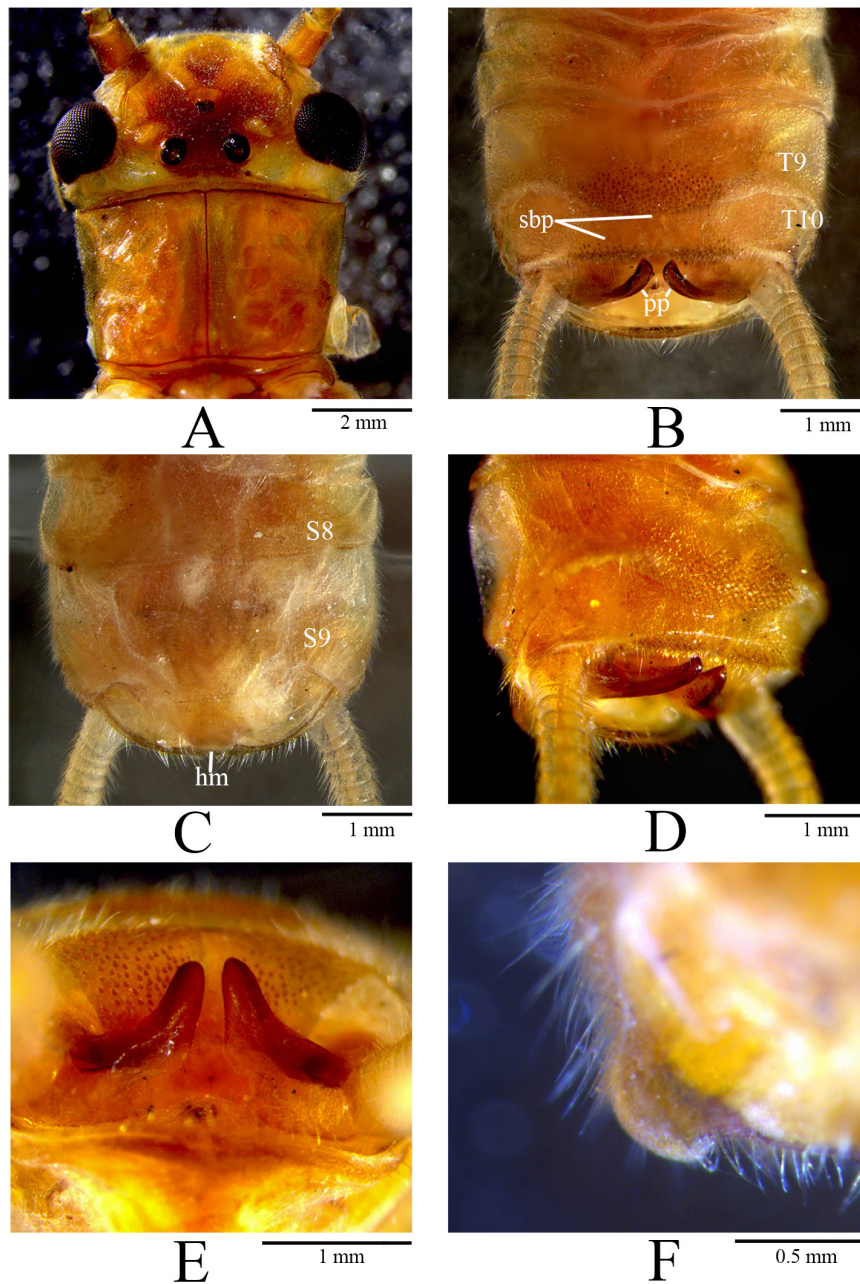


Fig. 1. *Sinacroneuria aequalis* sp. nov., ♂, holotype (HIST). **A.** Head and pronotum, dorsal view. **B.** Terminalia, dorsal view. **C.** Terminalia, ventral view. **D.** Terminalia, oblique lateral view. **E.** Paraproct, caudal view. **F.** Hammer, lateral view.

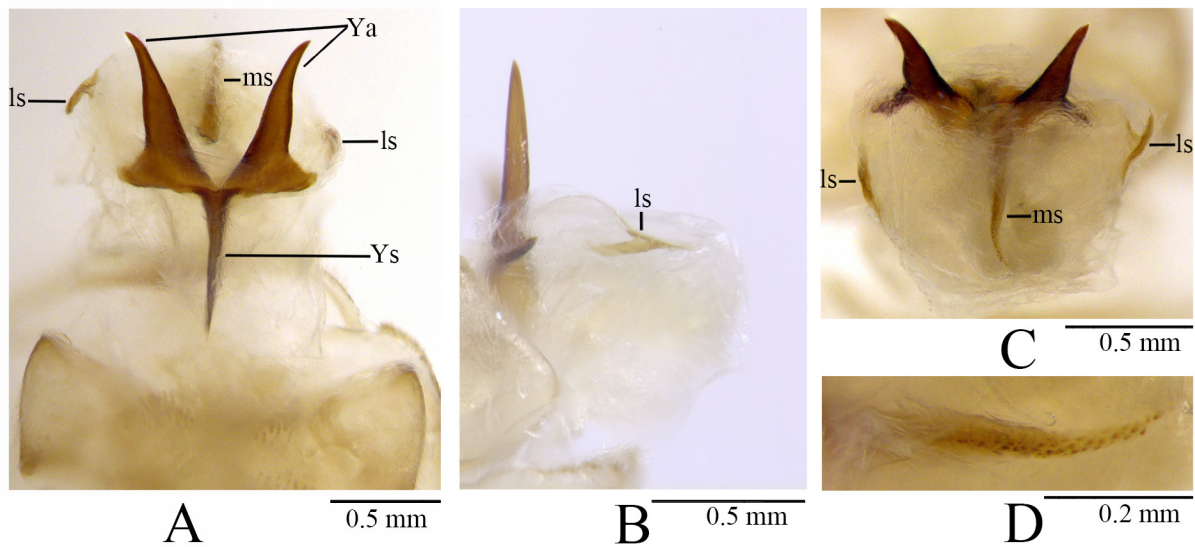


Fig. 2. *Sinacroneuria aequalis* sp. nov., ♂, holotype (HIST). **A.** Aedeagus, dorsal view. **B.** Aedeagus, lateral view. **C.** Aedeagus, caudal view. **D.** Median sclerite, caudal view.

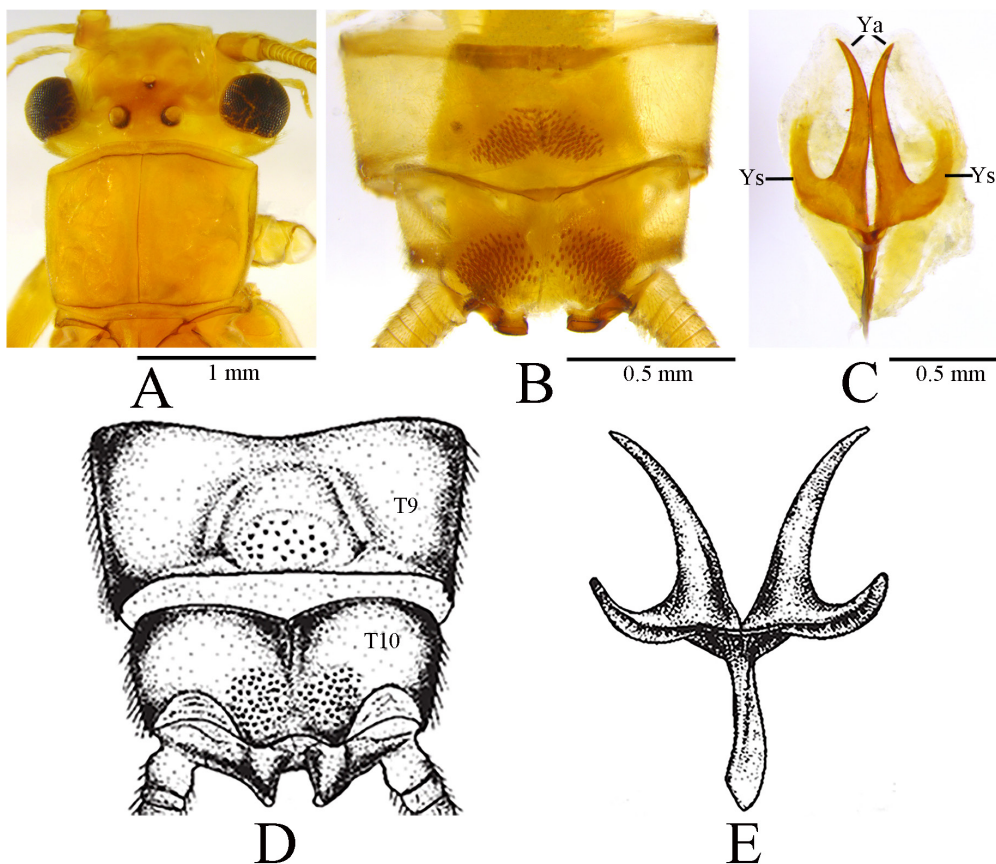


Fig. 3. **A–C.** *Sinacroneuria longwangshana* (Yang & Yang, 1998), ♂, paratype (PLE031). **A.** Head and pronotum, dorsal view. **B.** Terminalia, dorsal view. **C.** Aedeagus, dorsal view. **D–E.** *Sinacroneuria lateralis* Sivec & Stark, 2020, ♂, holotype. **D.** Terminalia, dorsal view. **E.** Aedeagus, dorsal view. D and E modified from Sivec & Stark (2020), scale bars unavailable from original source.

Etymology

The specific name refers to Y-arm and Y-stem being equal in length. The Latin adjective ‘*aequalis*’ means ‘equal’.

Type material

Holotype

CHINA • ♂; Fujian Province, Nanping city, Mt Wuyi, Tongmuguan; 27°45' N, 117°40' E; 1150 m a.s.l.; 31 May 1990; Lian-Fang Yang and Chang-Hai Sun leg.; HIST.

Description

Male

ADULT HABITUS (Fig. 1A). General body color yellowish brown. Body length 20.0 mm; forewing length 17.5 mm; hindwing length 15.6 mm. Triocellate, anterior ocellus smaller. Distance between ocelli almost $2 \times$ diameter of extended ocellus. Head brown with dark brown area covering ocellar triangle, slightly extending laterally; triangular marking forward of M-line brown. Compound eyes black. Antennae generally brown. Pronotum rectangular, with obscure rugosities. Wing membrane transparent, veins brown. Legs brownish. Abdominal segments brownish, terminalia brown.

ABDOMEN (Fig. 1B–F). Tergum 9 with posterior margin projecting and medially with subrectangular sensilla basiconica patch. Tergum 10 sensilla basiconica patches triangular and medially completely divided. Paraprocts broad basally, heavily reflexed inward and forward. Hammer present on posterior margin of sternum 9, generally oval-shaped and slightly hexagonal. Hammer convex in lateral view.

AEDEAGUS (Fig. 2). Everted; Aedeagal Y-stem and Y-arm subequal in length. Y-stem laterally compressed. Y-arms horn-like, wide basally and apically tapering, curved outward and upward, set far from each other; basal half of lateral sclerites weakly but apical half heavily sclerotized and band-like. Median sclerite, located on ventral side, brown, long and filiform, fully covered with short spines.

Female

Unknown.

Distribution

China: Fujian Province. Presently only known from Mt Wuyi.

Remarks

Sinacroneuria aequalis sp. nov. shares a similar head pattern and sensilla basiconica patches with *S. longwangshana* (Yang & Yang, 1998) (compare Fig. 1A–B with Fig. 3A–B). However, in *S. longwangshana*, the aedeagal Y-stem is much shorter than the Y-arms and the basal halves of the lateral sclerites are heavily sclerotized (compare Fig. 2A with Fig. 3C). This new species also resembles *S. lateralis* Sivec & Stark, 2020 in having similar sensilla patches of tergum 10 and aedeagal sclerites (compare Figs 1E, 2C with Fig. 3D–E); however, the aedeagus of *S. lateralis* lacks a median sclerite (compare Fig. 2C with Fig. 3E).

Sinacroneuria transversa sp. nov.

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Figs 4–6; Table 1

Diagnosis

Tergum 9 with a transverse sensilla basiconica patch covering the entire width of the segment. Aedeagus mostly membranous. The everted aedeagus with straight aedeagal arms. Median sclerite crescent.

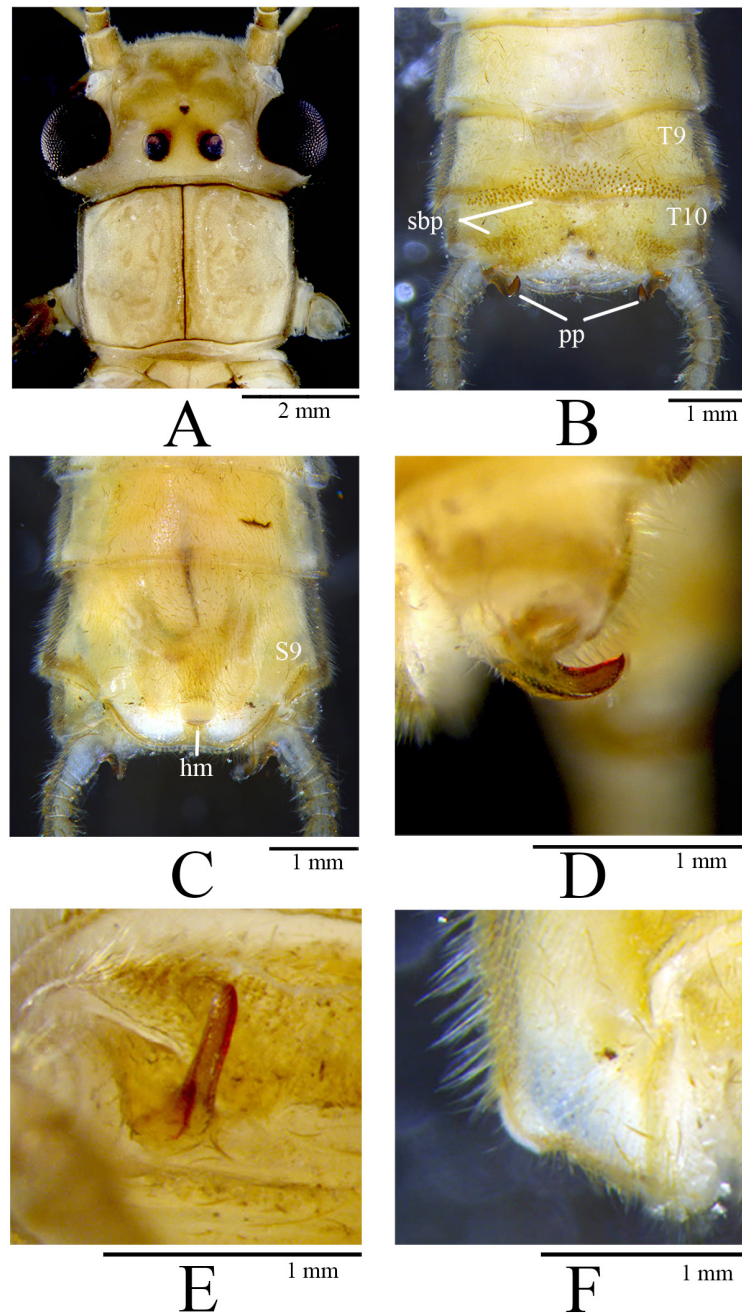


Fig. 4. *Sinacroneuria transversa* sp. nov., ♂, holotype (CAU). **A.** Head and pronotum, dorsal view. **B.** Terminalia, dorsal view. **C.** Terminalia, ventral view. **D.** Paraproct, oblique lateral view. **E.** Paraproct, caudal view. **F.** Hammer, lateral view.

Etymology

The specific name refers to the transverse patch of sensilla basiconica on tergum 9. The Latin adjective '*transversa*' means 'transverse'.

Type material

Holotype

CHINA • ♂; Fujian Province, Mt Wuyi, Kekao station; 27°44.57' N, 117°40.45' E; 735 m a.s.l; 12 July 2009; Li Shi, Xiao-Yan Liu leg.; light trap; CAU.

Paratype

CHINA – Zhejiang Province • 1 ♂; Lishui city, Mt Fengyang; 27°55' N, 119°13' E; 1178 m a.s.l; 30 July 2007; Jing-Xian Liu leg.; HIST.

Description

Male

ADULT HABITUS (Fig. 4A). General body color yellow brownish. Body length 16.5 mm; forewing length 14.3 mm, hindwing length 12.8 mm. Triocellate, anterior ocellus smaller, distance between posterior ocelli almost equal to width the ocellus. Head with brown area covering ocellar triangle, slightly extending laterally under pale M-line and with V-shaped brown marking forward of M-line. Compound eyes black. Antennae brown, flagellum distally brownish. Pronotum brownish and subrectangular, with obscure rugosities. Legs brownish. Wing membrane transparent, veins brown. Abdominal segments brownish to brown, cerci brown.

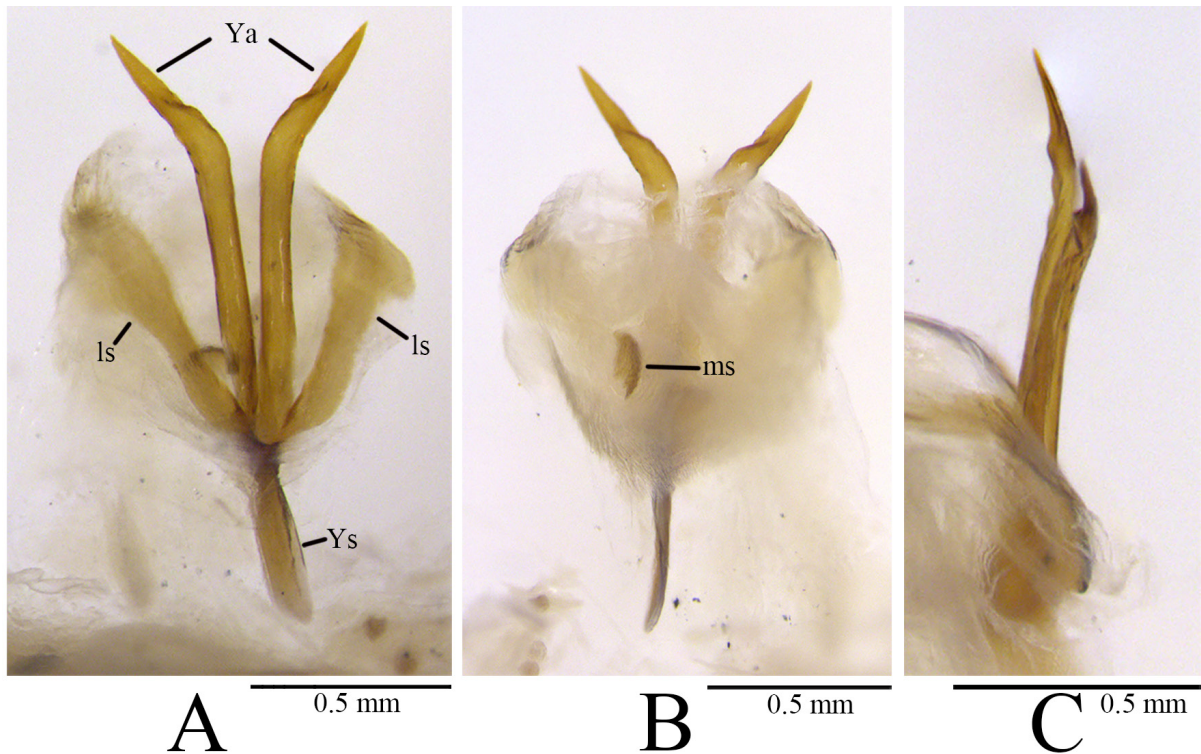


Fig. 5. *Sinacroneuria transversa* sp. nov., ♂, holotype (CAU). **A.** Aedeagus, dorsal view. **B.** Aedeagus, ventral view. **C.** Aedeagus, lateral view.

ABDOMEN (Fig. 4B–F). Tergum 9 with transverse sensilla basiconica patch nearly covering the entire width of segment. Sensilla basiconica patch of tergum 10 small, widely divided medially. Paraprocts hook-like and heavily sclerotized, tips sharp and more slender in caudal view. Hammer oval and set near posterior margin of sternum 9. Hammer slightly projecting in lateral view.

AEDEAGUS (Fig. 5). Everted aedeagus with Y-arms about $3\times$ as long as Y-stem, and with a pair of adjacent lateral sclerites of same origin as arms. Y-arms basally straight and narrowly separated, with distal third abruptly outcurved to form horn-like structure, with subapical notch. In ventral view, median sclerite brown, generally crescent.

Female

Unknown.

Distribution

China: Fujian and Zhejiang provinces.

Remarks

The new species seems unique among all known species in having a wide transverse sensilla basiconica patch of tergum 9 which nearly covers the entire width of the segment. It is also characterized by a roughly straight aedeagal arms for the most of their length with a mesodorsal notch at outcurved apex (Fig. 4).

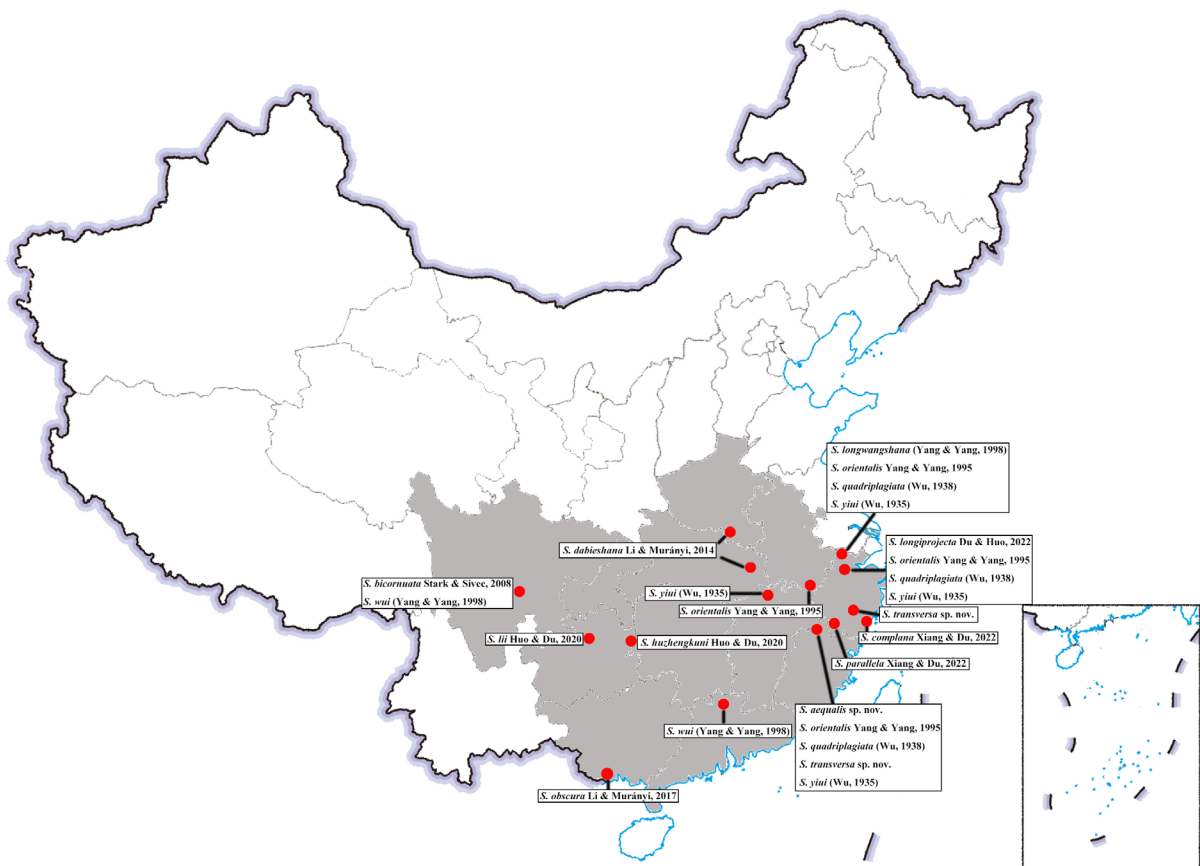


Fig. 6. Distribution of the species of *Sinacroneuria* Yang & Yang, 1995 known from China. City records are shaded in grey.

Table 1. Checklist of species belonging to the genus *Sinacroneuria* Yang & Yang, 1995.

Species	Sources	Distribution
<i>S. acuticornis</i> Uchida, 2017	Li <i>et al.</i> 2017	Japan: Honshu (Ishikawa and Nara prefectures)
<i>S. aequalis</i> sp. nov.	current study	China: Fujian
<i>S. bicornuata</i> Stark & Sivec, 2008	Stark & Sivec 2008; Li <i>et al.</i> 2014; Murányi & Li 2016; Yang & Li 2018	China: Sichuan
<i>S. biocellata</i> Stark & Sivec, 2008	Stark & Sivec 2008; Li <i>et al.</i> 2014; Murányi & Li 2016	Vietnam: Laocai
<i>S. complana</i> Xiang & Du, 2022	Xiang <i>et al.</i> 2022	China: Zhejiang
<i>S. dabieshana</i> Li & Murányi, 2014	Li <i>et al.</i> 2014; Murányi & Li 2016; Yang & Li 2018; Cao <i>et al.</i> 2019	China: Henan, Hubei
<i>S. fujianensis</i> Siveci & Stark, 2020	Sivec & Stark 2020	China: Fujian
<i>S. huzhengkuni</i> Huo & Du, 2020	Huo & Du 2020	China: Guizhou
<i>S. lateralis</i> Siveci & Stark, 2020	Siveci & Stark 2020	China: Fujian
<i>S. lii</i> Huo & Du, 2020	Huo & Du 2020	China: Guizhou
<i>S. longiprojecta</i> Du & Huo, 2022	Xiang <i>et al.</i> 2022	China: Zhejiang
<i>S. longwangshana</i> (Yang & Yang, 1998)	Yang & Yang 1998; Du <i>et al.</i> 2001; Li <i>et al.</i> 2014; Murányi & Li 2016; Yang & Li 2018; Sivec & Stark 2020	China: Zhejiang
<i>S. obscura</i> Li & Murányi, 2017	Li & Murányi 2017	China: Guangxi
<i>S. orientalis</i> Yang & Yang, 1995	Yang & Yang 1995; Du <i>et al.</i> 1999; Li <i>et al.</i> 2014; Murányi & Li 2016; Yang & Li 2018; Sivec & Stark 2020;	China: Anhui, Zhejiang
<i>S. parallela</i> Xiang & Du, 2022	Xiang <i>et al.</i> 2022	China: Zhejiang
<i>S. quadriplagiata</i> (Wu, 1938)	Wu 1938; Illies 1966; Du <i>et al.</i> 2001; Li <i>et al.</i> 2014; Murányi & Li 2016; Yang & Li 2018	China: Zhejiang
<i>S. sinica</i> (Yang & Yang, 1998)	Yang & Yang 1998; Murányi & Li 2016; Yang & Li 2018; Liu <i>et al.</i> 2019	China: Zhejiang
<i>S. transversa</i> sp. nov.	current study	China: Fujian, Zhejiang
<i>S. wui</i> (Yang & Yang, 1998)	Yang & Yang 1998; Du <i>et al.</i> 2001; Li <i>et al.</i> 2014; Murányi & Li 2016; Yang & Li 2018; Mo <i>et al.</i> 2022	China: Guangdong, Zhejiang
<i>S. yiui</i> (Wu, 1935)	Wu 1935; Wu 1938; Illies 1966; Du <i>et al.</i> 2001; Li <i>et al.</i> 2014; Murányi & Li 2016; Yang & Li 2018	China: Jiangxi, Sichuan, Zhejiang

Discussion

Eighteen species were previously recorded worldwide in the *Sinacroneuria* (DeWalt *et al.* 2023) including 16 species distributed primarily in the central and oriental China (Table 1, Fig. 6). *Sinacroneuria* is externally similar to *Acroneuria* in the paraprocts, tergal patches of sensilla basiconica and hammer. Both genera are often confused in earlier works. *Sinacroneuria* is readily separated from *Acroneuria* by the Y-shaped aedeagal sclerite. Therefore, in future studies, the examination of the aedeagus structures is necessary for distinction of these two genera.

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