



## Monograph

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# Taxonomic review of *Kokeshia* Miyamoto, 1960 from China, with description of ten new species (Hemiptera: Heteroptera: Schizopteridae)

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**Abstract.** The species of *Kokeshia* Miyamoto, 1960 from China are reviewed, *K. hsiao* Ren & Zheng, 1992 is redescribed, and ten new species from China are described. Among these new species, *K. bairi* sp. nov., was collected from Hong Kong, and the other nine, *K. acutiformis* sp. nov., *K. bui* sp. nov., *K. caii* sp. nov., *K. drepanoides* sp. nov., *K. hilli* sp. nov., *K. pengae* sp. nov., *K. redeii* sp. nov., *K. renae* sp. nov. and *K. weirauchae* sp. nov., from Yunnan. Thus, the number of known species of this genus is increased from eight to eighteen. Photographs of the habitus, forewing, abdomen and genitalic structures; drawings and scanning electron micrographs of male abdomen and genitalic structures are provided. A key to all the species currently recognized in the genus *Kokeshia* is presented, a distribution map and checklist for all known species is provided.

**Keywords.** Dipsocoromorpha, Schizopteridae, *Kokeshia*, Hong Kong.

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<https://doi.org/10.5852/ejt.2022.802.1687>

## Introduction

Dipsocoromorpha Miyamoto, 1961, also known as minute litter bugs, is one of the basal infraorders within true bugs. Their tiny body size and cryptic habits cause them to be one of the least known groups in Heteroptera Latreille, 1810. This infraorder currently comprises 6 families and about 430 species worldwide (Štys 1995; Weirauch *et al.* 2018; Knyshov *et al.* 2020). Schizopteridae Reuter, 1891, the largest family of Dipsocoromorpha, had been divided into 3 subfamilies: Hypselosomatinae Esaki & Miyamoto, 1959, Ogeriinae Emsley, 1969 and Schizopterinae Reuter, 1891 by Emsley (1969), and this classification system was accepted by several subsequent authors (Štys 1985; Hill 2004; Weirauch & Štys 2014). According to that system, the genus *Kokeshia* was previously placed in Ogeriinae. The subfamily Ogeriinae was established by Emsley (1969), comprising *Ogeria* Distant, 1913; *Pachyplagia* Gross,

1951; *Luachimonannus* Wygodzinsky, 1950; *Kokeshia* Miyamoto, 1960; *Chinannus* Wygodzinsky, 1948. The diagnostic characters of Ogeriinae are as below: five veins emanating from the trapezoidal cell of the forewing; labium 4-segmented; various tarsal formulae and pretarsal appendages; elongate spermatheca; three pairs of abdominal spiracles. According to Emsley's three-subfamilies classification system, many genera could not be allocated to any subfamily of Schizopteridae. Weirauch & Štys (2014) published the first cladistic analysis of Dipsocoromorpha based on molecular data, in which Ogeriinae was shown as monophyletic. Until recently, the phylogenetic research of Dipsocoromorpha (Knyshov *et al.* 2020) based on combined morphological and molecular data with more comprehensive taxon sampling showed that Ogeriinae is paraphyletic with respect to Schizopterinae in all analyses. Based on such result, the Ogeriinae was synonymized with Schizopterinae. The present work accepts the taxonomic treatment that the family Schizopteridae comprises two subfamilies, Hypselosomatinae and Schizopterinae (including former Ogeriinae and Schizopterinae). Up to now, Schizopteridae comprises about 60 genera and 355 species (Schuh & Weirauch 2020).

*Kokeshia* (Schizopteridae) was established by Miyamoto (1960) based on *Kokeshia esakii* Miyamoto, 1960 which was discovered from Japan. After that work, Štys (1985) described two new species from Nepal, *K. martensi* Štys, 1985 and *K. similis* Štys, 1985. Subsequently, Ren & Zheng (1992) described *K. hsiaoi* Ren & Zheng, 1992 from China. Entering the 21<sup>st</sup> Century, Rédei (2008) described two new species, *K. stysi* Rédei, 2008 and *K. oroszi* Rédei, 2008 from India and Thailand respectively, and provided the key to all known species of the genus. After that, Rédei *et al.* (2012) described two more new species from China, *K. xiei* Rédei, Ren & Bu, 2012 and *K. zhengi* Rédei, Ren & Bu, 2012. Currently, the genus *Kokeshia* contains eight described species, and three of them were reported in China.

In the present paper, all known species from China are reviewed, *K. hsiaoi* is redescribed, and ten new species from Hong Kong and Yunnan are described. The images and drawings of diagnostic characters of all species from China are provided. Besides, a key for identification, a distribution map and a checklist of all known species are also provided.

## Material and methods

Specimens were collected by hand collecting from leaf litters, light trap and pitfall trap from forests. Specimens were preserved in 80% ethanol in the field.

External structures and genitalic structures were examined using a Zeiss Discovery V20 stereo microscope. Measurements were taken using a Zeiss Discovery V20 stereo microscope with the software ZEN ver. 2.5 pro. Male abdomen and genitalia were macerated in warm 10% potassium hydroxide solution (KOH). Photographs of habitus, forewing, abdomen and genitalia were taken by using a Canon EOS 7D Mark II camera equipped with a tube lens and a Mitutoyo M Plan Apo 10× objective lens. Drawings of abdominal segment VIII, parameres and phallus were made using a camera lucida from an Olympus CX41 optical microscope under a 40× objective lens. Scanning electron micrographs of abdomen and genitalia of male were prepared using a Hitachi S-3400N Scanning Electron Microscope. Maps were prepared using SimpleMappr (<http://www.simplemappr.net/>).

Morphological terminology follows Štys (1985), Rédei *et al.* (2012), and Weirauch *et al.* (2020).

## Institutional abbreviations

- ELKU = Entomological Laboratory, Kyushu University, Fukuoka, Japan
- HNHM = Hungarian Natural History Museum, Budapest, Hungary
- MSIE = Shanghai Institute of Entomology, Shanghai, China
- NKUM = Institute of Entomology, Nankai University, Tianjin, China
- SMFD = Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt am Main, Germany

SYSBM = Museum of Biology, Sun Yat-sen University, Guangzhou, China

### Abbreviations for morphological terms

aph	=	apical portion of phallus
bc	=	basal cell
bpr	=	basal process of phallus
C	=	costa
cf	=	costal fracture
Cu	=	cubitus
dag	=	dorsal abdominal gland
dc	=	discal cell
fav	=	fused apical portion of posterior remigial veins
lht8	=	left hemitergite VIII
lp	=	left paramere
M	=	media
plht8	=	process of left hemitergite VIII
prht8	=	process of right hemitergite VIII
prt8	=	process on the right portion of tergite VIII
py	=	pygophore
R	=	radius
rht8	=	right hemitergite VIII
rp	=	right paramere
Sc	=	subcosta
sc	=	subcostal cell
s2-7	=	sternite of abdominal segments II to VII
tc	=	trapezoidal cell
tp	=	triangular process
t1-8	=	tergite of abdominal segments I to VIII
X	=	abdominal segment X
XI	=	abdominal segment XI
1An	=	first anal vein
2An	=	second anal vein

## Results

### *Taxonomy*

Class Insecta Linnaeus, 1758  
Order Hemiptera Linnaeus, 1758  
Suborder Heteroptera Latreille, 1810  
Infraorder Dipsocoromorpha Miyamoto, 1961  
Family Schizopteridae Reuter, 1891  
Subfamily Schizopterinae Reuter, 1891

Genus *Kokeshia* Miyamoto, 1960

*Kokeshia* Miyamoto, 1960: 163.

### Type species

*Kokeshia esakii* Miyamoto, 1960 by original designation.

## Diagnosis

The genus *Kokeshia* can be recognized among Schizopterinae (including the former ‘Ogeriinae’) by the following combination of characters: (a) labium short, four-segmented; (b) tarsal formula 2–2–3; (c) forewing with costal fracture, C+Sc, R+M and R prominently thicker than other veins, medial fracture very short, subcostal cell elongated triangular, trapezoidal cell with five emanating veins, free distal remigial veins usually with a fused apical portion, and terminate before wing margin; (d) male abdominal tergite VII and sternite VII slightly asymmetrical, tergite VIII usually subdivided into two parts, and left hemitergite VIII usually with process; (e) apical portion of phallus sclerotized, tubular and coiled. The venation of forewing is similar to genus *Caucanannus* Weirauch *et al.*, 2020 and *Guapinannus* Wygodzinsky, 1951 in welling-developed costal fracture; prominently thick C+Sc, R+M and R; R with only one branch; abdomen of male well sclerotized, and near symmetrical, with well-developed tergites, but it can be distinguished from the latter two genus by M normal, without wing organ or gland; free distal remigial veins usually with a fused apical portion, and terminate before wing margin, instead of reaching to wing margin.

## Redescription

**BODY.** Body small (about 1.07–1.49 mm), suboval (Fig. 1A–C). Only macropterous male and brachypterous female reported up to now (hind wings absent in female).

**COLORATION.** Body color relatively uniform, light brown to brown; antennae, labium and legs yellowish brown (Fig. 1A–C).

**SURFACE AND VESTITURE.** Cuticle matt; head, thorax, veins of forewing, and abdomen with relatively dense, short, and adpressed setae. Anteclypeus with long setae; antennal segments I and II with short curved setae, segments III and IV with very long semi-erect to erect setae. Legs with relatively long, rather dense semi-erect setae.

**HEAD.** Head short and vertical, wider than long in frontal view. Eyes small, wide of eye about  $\frac{1}{8}$  × as wide as head in frontal view, raspberry appearance; ocelli present in macropterous male and absent in brachypterous female, located on anterior portion of fronto-vertex close to eyes in male. Labium short, 4-segmented, reaching to middle coxae, segment I stoutest, segments II and III subequal in length and diameter, segment IV longest and tapering to tip. Antennal segments I and II thick and short, subequal in length; segments III and IV slender, subequal in length as well.

**THORAX.** Pronotum of male broad, near trapezoid, about  $\frac{3}{5}$  × as long as wide, with distinct collar; collar short and broad, about  $\frac{1}{6}$  × as long as pronotum, middle part of posterior margin concave. Pronotum of female smaller than male, posterior margin slightly arc-shaped concave. Scutellum small, with small tongue-shaped apex, two small pits located in middle area near base. Tarsal formula in both sexes is 2–2–3. Metasternum with high, rounded central process (Fig. 1C). Forewings of male exceed apex of abdomen, costal fracture distinct. Venation unique, C+Sc, R+M and R prominently thicker than other veins, medial fracture very short, subcostal cell elongated triangular, trapezoidal cell with five emanating veins, free distal remigial veins usually with fused apical portion, and terminate before wing margin; subcostal cell triangular and elongate, with elongate quadrangular basal and elongate pentagonal discal cell (Fig. 1A). Forewings of female short, surpassing posterior margin of tergite IV (*K. esakii* Miyamoto, 1960) to reaching tergite VII (*K. martensi* Štys, 1985, *K. similis* Štys, 1985 and *K. stysi* Rédei, 2008).

**ABDOMEN.** Pregenital abdomen strongly sclerotized, tergites I and II fused together, can be distinguished by a transverse groove; sternite I absent, sternites II and III fused, boundary could not be recognized (Fig. 1D). Tergite VII of male large, slightly asymmetrical, sternite VII large, almost symmetric to slightly asymmetrical, forming a bowl-shaped subgenital plate. Sternite VIII of male probably absent, invisible

in appearance, tergite VIII of male in all except *K. acutiformis* sp. nov. subdivide into two asymmetrical hemitergites, left hemitergite usually with process in different shapes and size (key diagnostic character for species identification) (Figs 1D–G, 2A–B).

GENITALIA. Pygophore asymmetrical, dorsally separated in appearance. Parameres strongly asymmetrical, distal projection of both left and right paramere elongate and flattened, but left paramere usually with angulate projection at base (Fig. 2D–G). Phallus with large basal process, apical portion sclerotized, tubular and coiled (Fig. 1D–E). Segment X asymmetrical, ring-shaped, segment XI membranous. Genitalia of female simple, tergite VIII and IX strongly sclerotized, visible in dorsal view, sternite IX with sclerotized intervalvular membrane.

***Kokeshia acutiformis* sp. nov.**

[urn:lsid:zoobank.org:act:063E5A54-D193-4A58-BA44-A7AC26B1121E](https://doi.org/10.3897/zoobank.org/act:063E5A54-D193-4A58-BA44-A7AC26B1121E)

Figs 1–2, 26A, 28A, 32

**Diagnosis**

*Kokeshia acutiformis* sp. nov. can be recognized from all other species of *Kokeshia* by male tergite VIII not subdivided into two hemitergites, only a long, flattened, acuminate process at right portion of tergite VIII, the process bent at about  $\frac{1}{3}$  from its apex (Figs 1D–G, 2A–B).

**Etymology**

The species epithet is derived from the Latin prefix ‘*acut-*’ and suffix ‘*-formis*’, means ‘acuminate shaped’, refers to the acuminate process of tergite VIII.

**Material examined**

**Holotype**

CHINA • ♂; Yunnan Province, Lincang City, Cangyuan County, Banhong Town; 23°18'44.65" N, 99°4'39.48" E; ca 920 m a.s.l.; 6 Aug. 2019; Jiu-Yang Luo leg.; light trap; SYSBM.

**Paratypes**

CHINA • 2 ♂♂; same collection data as for holotype; SYSBM.

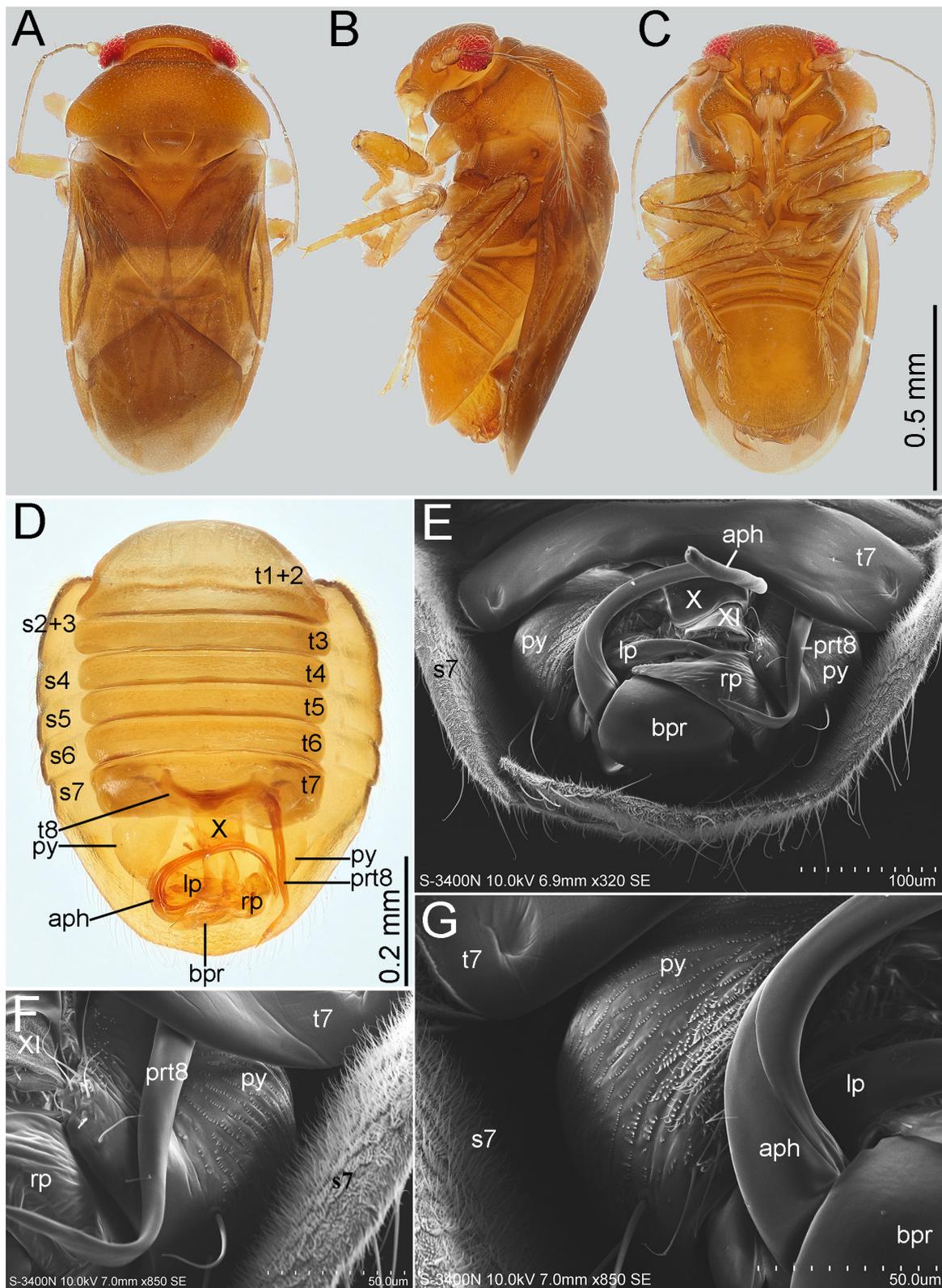
**Description**

**Male**

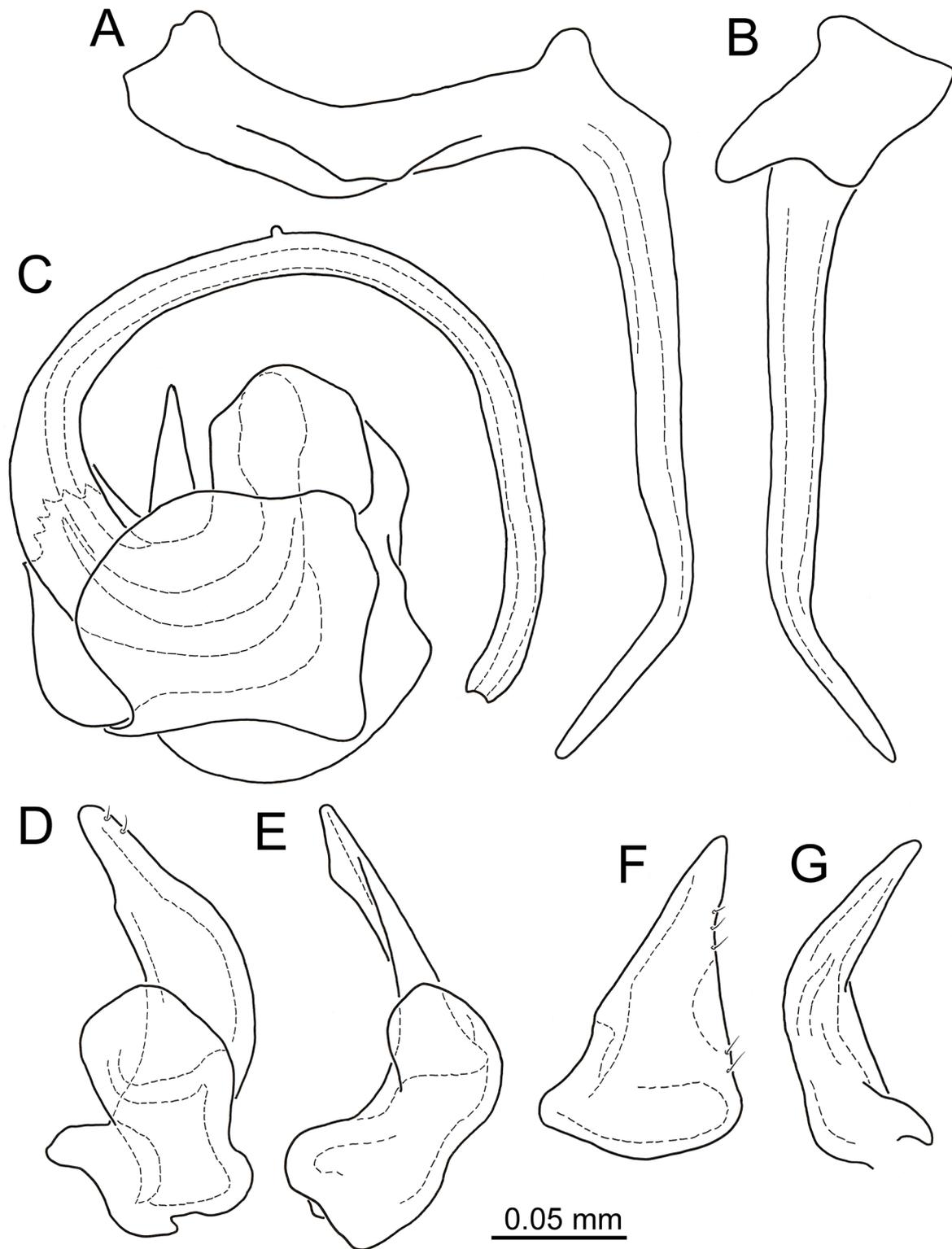
MEASUREMENTS (in mm) (male holotype / male paratypes, N = 2). Total body length 1.32 / 1.28–1.29; length of head 0.22 / 0.23–0.25, maximum width across eyes 0.41 / 0.40, interocular distance 0.24 / 0.22; length of antennal segment I 0.08 / 0.07–0.08, segment II 0.08 / 0.08, segment III 0.28 / 0.28, segment IV 0.30 / 0.30; length of labial segment I 0.07 / 0.07–0.08, segment II 0.05 / 0.05, segment III 0.04 / 0.04, segment IV 0.11 / 0.10; middle length of pronotum 0.35 / 0.36, length of collar 0.06 / 0.06–0.07, humeral width 0.59 / 0.60; length of forewing 1.07 / 0.95–1.08; length of fore femur 0.33 / 0.29–0.31, fore tibia 0.31 / 0.32, fore tarsus 0.12 / 0.11–0.12; length of middle femur 0.31 / 0.33, middle tibia 0.32 / 0.31, middle tarsus 0.12 / 0.12; length of hind femur 0.36 / 0.35–0.36, hind tibia 0.50 / 0.53–0.55, hind tarsus 0.17 / 0.17–0.18; greatest width of abdomen 0.53 / 0.53.

MACROPTEROUS. Small sized (about 1.28–1.32 mm).

COLORATION. Body yellowish brown to light brown, appendages yellowish brown (Fig. 1A–C). Surface, vestiture and general structures as in generic description, except mentioned below.



**Fig. 1.** *Kokeshia acutiformis* sp. nov. A–C. Habitus, holotype, ♂ (SYSBM). A. Dorsal view. B. Lateral view. C. Ventral view. D. Pregenital abdomen and genitalia, dorsal view, paratype, ♂ (SYSBM). E–G. Scanning electron micrographs of genitalia, paratype, ♂ (SYSBM). E. Dorsal view. F. Right side, dorsal view. G. Left side, dorsal view. Abbreviations: see Material and methods.



**Fig. 2.** *Kokeshia acutiformis* sp. nov., segment VIII and genitalia, paratype, ♂ (SYSBM). **A–B.** Left hemitergite VIII. **A.** Dorsal view. **B.** Right lateral view. **C.** Phallus. **D–E.** Left paramere, two different aspects. **F–G.** Right paramere, two different aspects.

HEAD. Interocular distance  $0.55\text{--}0.59 \times$  length of maximum width across eyes.

THORAX. Humeral width  $1.66\text{--}1.68 \times$  as long as middle length of pronotum. Venation of forewing in accordance with general pattern of genus. C+Sc, R+M, R and basal portion of 1An darker than wing surface, other veins slightly darker than wing surface (Fig. 26A).

ABDOMEN. Tergite VII slightly asymmetrical, right portion wider than left portion, sternite VII nearly symmetrical. Tergite VIII not subdivided into two hemitergites, only a long, flattened, acuminate process at right portion of tergite VIII, process bent at about  $\frac{1}{3}$  from its apex (Figs 1D–G, 2A–B).

GENITALIA. Pygophore slightly asymmetrical, dorsum with rows of tooth like microtrichia, posterior area with about twelve relatively long setae (Fig. 1D–G). Parameres strongly asymmetrical, left paramere (Figs 1E, 2D–E) with broadly squarish laminate extension directed dorsal near base, and with flattened and elongate distal projection; right paramere (Figs 1E, 2F–G) with flattened and acute, near triangular distal projection, curved inward at middle portion. Apical portion of phallus (Figs 1D–E, 2C) tubular, short, forming one incomplete coil outside of pygophore.

#### Female

Unknown.

#### Distribution

China: Yunnan (Fig. 32).

#### *Kokeshia baii* sp. nov.

[urn:lsid:zoobank.org:act:041A2018-1306-4728-8117-109E54315783](https://doi.org/10.21203/rs.3.rs-13064728/v1)

Figs 3–4, 26B, 28B, 32

#### Diagnosis

*Kokeshia baii* sp. nov. can be recognized from other species of *Kokeshia* by male tergite VIII subdivided into two hemitergites, left hemitergite VIII (Figs 3D–E, G, 4A–B) with a long, finger-shaped process, which bearing three thick, spiniform microtrichia at the ventral side of its apex; right hemitergite VIII (Figs 3E–G, 4C, I) with an upward curling, rectangular lamellate process above tergite VII, lateral margin of it serrated.

#### Etymology

The species epithet is derived from and dedicated to its collector, our colleague Prof. Ming Bai (Institute of Zoology, Chinese Academy of Sciences, China).

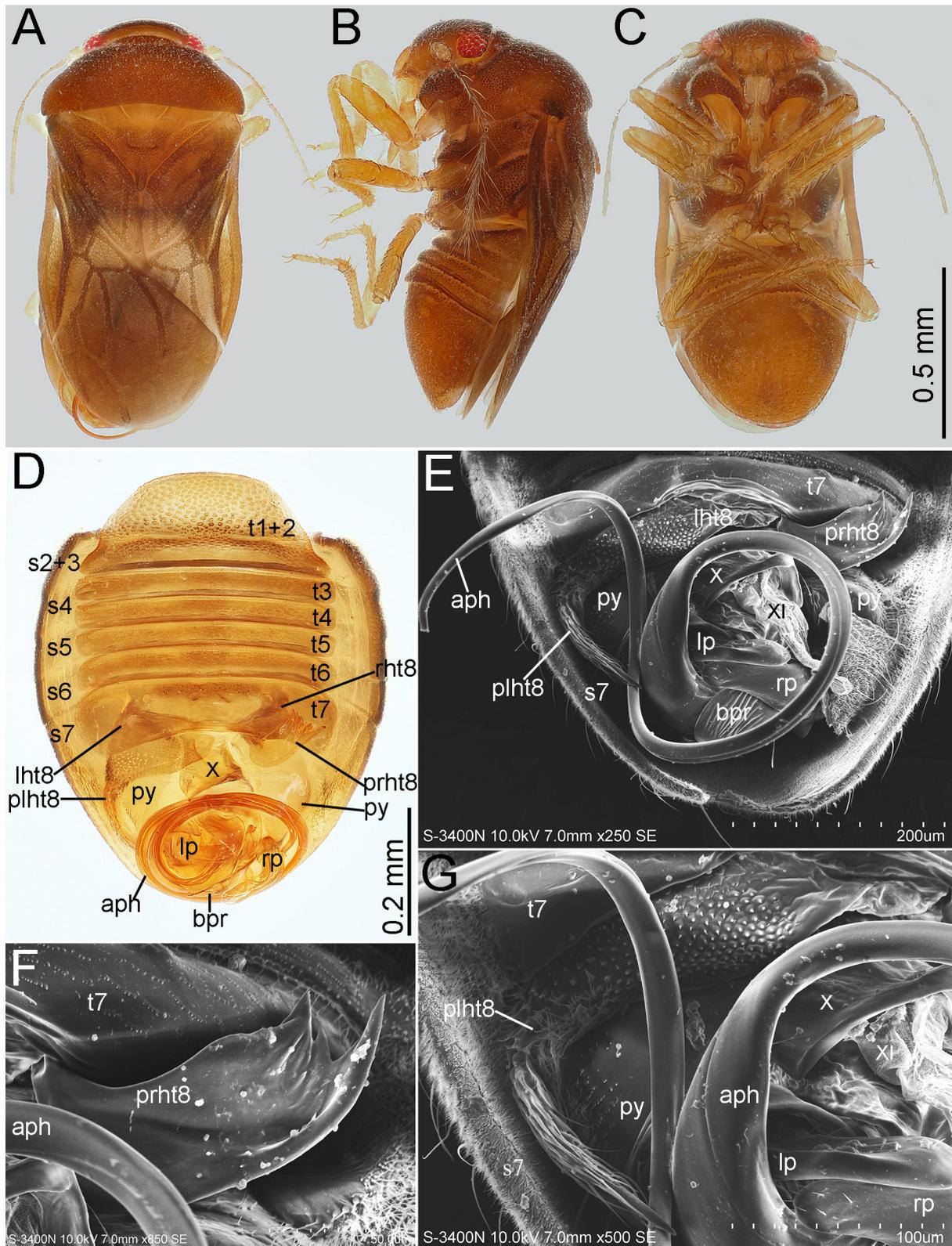
#### Material examined

##### Holotype

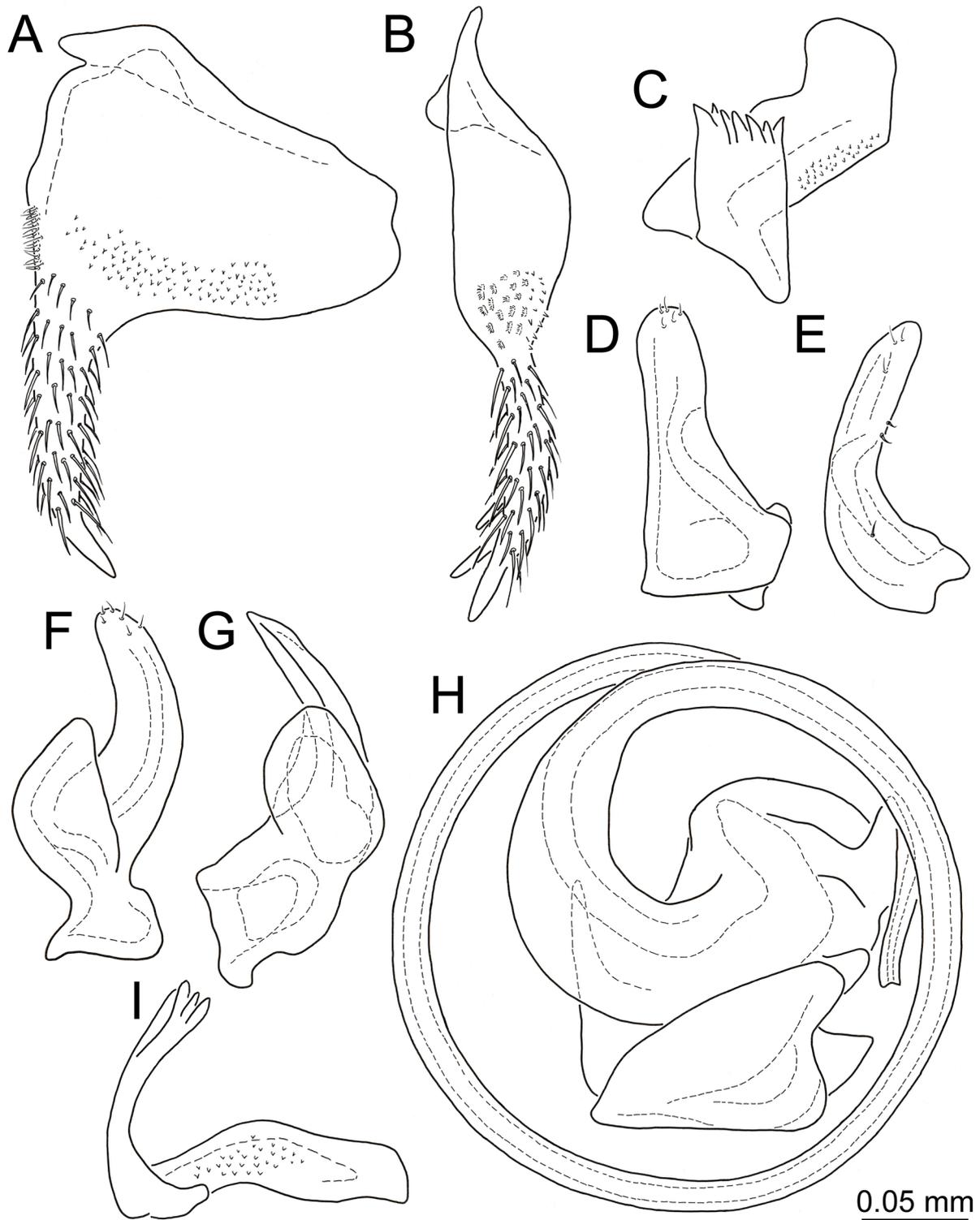
CHINA • ♂; Hong Kong, Lantau Island, Tei Tong Tsai; 15~20 May 2019; Ming Bai leg.; pitfall trap; SYSBM.

##### Paratypes

CHINA • 5 ♂♂; same collection data as for holotype; SYSBM.



**Fig. 3.** *Kokeshia baii* sp. nov. **A–C.** Habitus, holotype, ♂ (SYSBM). **A.** Dorsal view. **B.** Lateral view. **C.** Ventral view. **D.** Pregenital abdomen and genitalia, dorsal view, paratype, ♂ (SYSBM). **E–G.** Scanning electron micrographs of genitalia, paratype, ♂ (SYSBM). **E.** Dorsal view. **F.** Right side, dorsal view. **G.** Left side, dorsal view. Abbreviations: see Material and methods.



**Fig. 4.** *Kokeshia bairi* sp. nov., segment VIII and genitalia, paratype, ♂ (SYSBM). **A–B.** Left hemitergite VIII. **A.** Dorsal view. **B.** Left lateral view. **C, I.** Right hemitergite VIII, two different aspects. **D–E.** Right paramere, two different aspects. **F–G.** Left paramere, two different aspects. **H.** Phallus.

## Description

### Male

MEASUREMENTS (in mm) (male holotype / male paratypes, N = 5). Total body length 1.21 / 1.20–1.28; length of head 0.26 / 0.21–0.25, maximum width across eyes 0.38 / 0.37–0.39, interocular distance 0.26 / 0.25–0.27; length of antennal segment I 0.07 / 0.06–0.07, segment II 0.07 / 0.06–0.08, segment III 0.28 / 0.26–0.29, segment IV 0.32 / 0.31–0.33; length of labial segment I 0.08 / 0.07–0.08, segment II 0.05 / 0.05–0.06, segment III 0.05 / 0.04–0.05, segment IV 0.10 / 0.10–0.13; middle length of pronotum 0.37 / 0.36–0.39, length of collar 0.06 / 0.06–0.07, humeral width 0.63 / 0.62–0.64; length of forewing 0.97 / 1.01–1.09; length of fore femur 0.30 / 0.29–0.30, fore tibia 0.33 / 0.31–0.33, fore tarsus 0.12 / 0.11–0.13; length of middle femur 0.32 / 0.32–0.35, middle tibia 0.33 / 0.31–0.34, middle tarsus 0.11 / 0.12–0.13; length of hind femur 0.36 / 0.37–0.38, hind tibia 0.54 / 0.51–0.57, hind tarsus 0.17 / 0.17–0.18; greatest width of abdomen 0.55 / 0.53–0.55.

MACROPTEROUS. Small sized (about 1.28–1.28 mm).

COLORATION. Body brown, appendages yellowish brown (Fig. 3A–C). Surface, vestiture and general structures as in generic description, except mentioned below.

HEAD. Interocular distance  $0.68\text{--}0.71 \times$  length of maximum width across eyes.

THORAX. Humeral width  $1.64\text{--}1.75 \times$  as long as middle length of pronotum. Venation of forewing in accordance with general pattern of genus. C+Sc, R+M, R and basal portion of 1An distinctly darker than wing surface, other veins darker than wing surface (Fig. 26B).

ABDOMEN. Tergite VII and sternite VII slightly asymmetrical. Tergite VIII subdivided into two hemitergites, left hemitergite VIII (Figs 3D–E, G, 4A–B) with long, finger-shaped process, which bearing three thick, spiniform microtrichia at ventral side of its apex, with numerous microtrichia on surface. Basal visible part of left hemitergite VIII with numerous small projections and microtrichia (Figs 3D–E, G, 4A–B). Right hemitergite VIII with upward curling, approximately rectangular, lamellate process above tergite VII, lateral margin serrated (Figs 3E–F, 4C, I).

GENITALIA. Pygophore slightly asymmetrical, dorsal surface with rows of microtrichia, posterior area with relatively long setae. Parameres strongly asymmetrical, left paramere (Figs 3E, 4F–G) with broadly rounded laminate extension directed dorsal near base, and with flattened and elongate distal projection somewhat curved inward; right paramere (Figs 3E, 4D–E) with flattened and blunt distal projection. Apical portion of phallus (Figs 3D–E, 4H) tubular, long, forming more than one and a half coils outside of pygophore.

### Female

Unknown.

### Distribution

China: Hong Kong (Fig. 32).

***Kokeshia bui* sp. nov.**

[urn:lsid:zoobank.org:act:2FE947B4-B43C-4039-9372-2F0BC071C017](https://doi.org/10.21203/rs.3.rs-1988881/v1)

Figs 5–6, 26C, 28C, 32

**Diagnosis**

*Kokeshia bui* sp. nov. can be recognized from other species of *Kokeshia* by male hemitergite VIII (Figs 5D–G, 6A–B) elongate, the left lateral margin slightly concave from about  $\frac{1}{3}$  of its apex, the posterior portion with an elongated triangular process, surpassing posterior margin of pygophore, right lateral margin of it with about nine subparallel, thick spiniform microtrichia.

**Etymology**

The species epithet is derived from and dedicated to Prof. Wenjun Bu (Institute of Entomology, Nankai University, China), recognizing his contributions to the study of taxonomy, phylogeny and biogeography of Heteroptera, and the taxonomy of Cecidomyiidae (Diptera).

**Material examined**

**Holotype**

CHINA • ♂; Yunnan Province, Lincang City, Cangyuan County, Banhong Town; 23°13'53.8" N, 99°2'42.94" E; ca 920 m a.s.l.; 4 Aug. 2019; Qiang Xie and Yu Men leg.; light trap; SYSBM.

**Paratypes**

CHINA • 10 ♂♂; same collection data as for holotype; SYSBM.

**Description**

**Male**

MEASUREMENTS (in mm) (male holotype / male paratypes, N = 5). Total body length 1.20 / 1.17–1.24; length of head 0.20 / 0.19–0.21, maximum width across eyes 0.41 / 0.37–0.39, interocular distance 0.26 / 0.25–0.26; length of antennal segment I 0.07 / 0.07–0.08, segment II 0.07 / 0.07–0.08, segment III 0.27 / 0.24–0.29, segment IV 0.31 / 0.28–0.35; length of labial segment I 0.07 / 0.07, segment II 0.06 / 0.04–0.05, segment III 0.05 / 0.03–0.05, segment IV 0.11 / 0.10–0.11; middle length of pronotum 0.35 / 0.34–0.36, length of collar 0.06 / 0.06–0.07, humeral width 0.62 / 0.60–0.64; length of forewing 0.95 / 0.88–1.00; length of fore femur 0.28 / 0.27–0.30, fore tibia 0.32 / 0.31–0.32, fore tarsus 0.12 / 0.11–0.14; length of middle femur 0.33 / 0.29–0.34, middle tibia 0.31 / 0.31–0.34, middle tarsus 0.12 / 0.11–0.12; length of hind femur 0.37 / 0.36–0.38, hind tibia 0.51 / 0.47–0.55, hind tarsus 0.18 / 0.17–0.19; greatest width of abdomen 0.51 / 0.51–0.54.

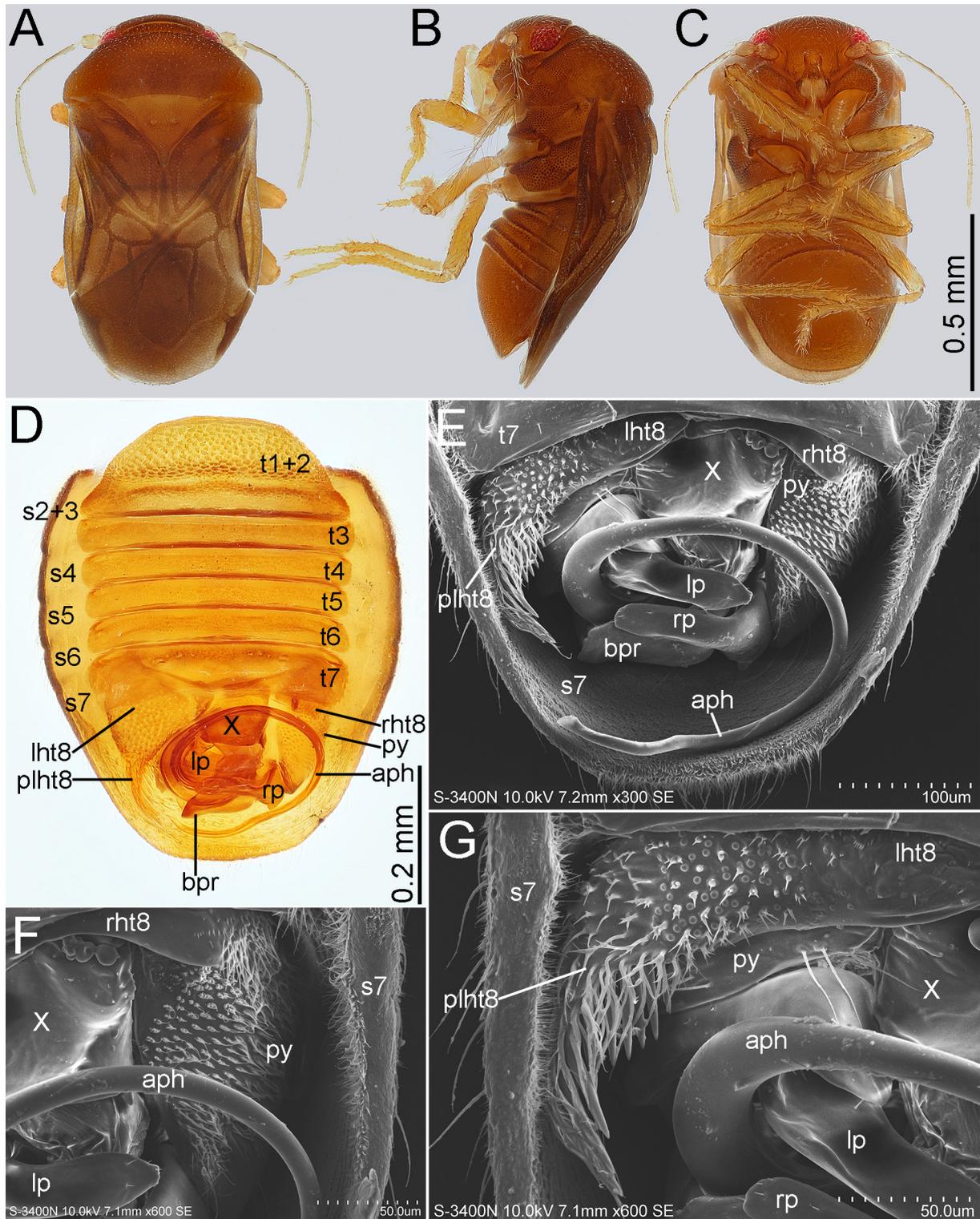
MACROPTEROUS. Small sized (about 1.17–1.24 mm).

COLORATION. Body brown, appendages yellowish brown (Fig. 5A–C). Surface, vestiture and general structures as in generic description, except mentioned below.

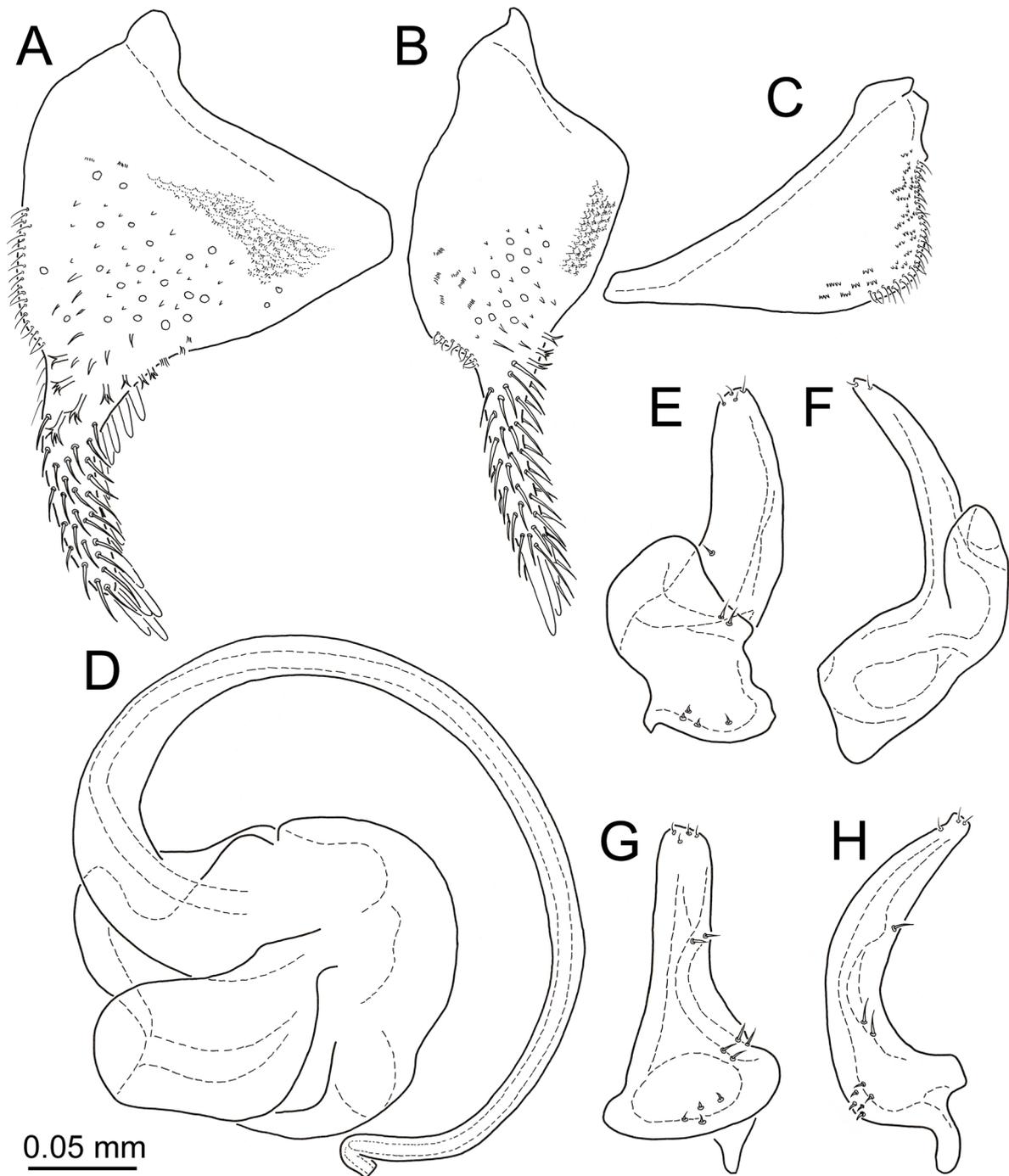
HEAD. Interocular distance  $0.63\text{--}0.68 \times$  length of maximum width across eyes.

THORAX. Humeral width  $1.67\text{--}1.78 \times$  as long as middle length of pronotum. Venation of forewing in accordance with general pattern of genus. C+Sc, R+M, R and basal portion of 1An distinctly darker than wing surface, other veins darker than wing surface (Fig. 26C).

ABDOMEN. Tergite VII and sternite VII slightly asymmetrical. Tergite VIII subdivided into two hemitergites, left hemitergite VIII with elongated triangular process, right margin with about 9



**Fig. 5.** *Kokeshia bui* sp. nov. **A–C.** Habitus, holotype, ♂ (SYSBM). **A.** Dorsal view. **B.** Lateral view. **C.** Ventral view. **D.** Pregenital abdomen and genitalia, dorsal view, paratype, ♂ (SYSBM). **E–G.** Scanning electron micrographs of genitalia, paratype, ♂ (SYSBM). **E.** Dorsal view. **F.** Right side, dorsal view. **G.** Left side, dorsal view. Abbreviations: see Material and methods.



**Fig. 6.** *Kokeshia bui* sp. nov., segment VIII and genitalia, paratype, ♂ (SYSBM). **A–B.** Left hemitergite VIII. **A.** Dorsal view. **B.** Left lateral view. **C.** Right hemitergite VIII, dorsal view. **D.** Phallus. **E–F.** Left paramere, two different aspects. **G–H.** Right paramere, two different aspects.

subparallel, thick spiniform microtrichia (Figs 5E, G, 6A–B). The basal portion of process bearing numerous small round projections. Short to moderate length microtrichia located at surface of process, ends of these microtrichia split into 2 to 5 branches (Fig. 5G). Right hemitergite VIII subtriangular, posterolateral portion projecting posteriad, with thin setae at its posterolateral margin.

GENITALIA. Pygophore slightly asymmetrical, dorsal surface densely covered with groups of setae on small, tightly connected projections, posterior area with relatively long setae. Parameres strongly asymmetrical, left paramere (Figs 5E, 6E–F) with broadly rounded laminate extension directed dorsal near the base, and with flattened and elongate distal projection slightly curved inward; right paramere (Figs 5E, 6G–H) with flattened and blunt distal projection. Apical portion of phallus (Figs 5D–E, 6D) tubular, relatively long, forming one complete coil outside of pygophore.

#### Female

Unknown.

#### Distribution

China: Yunnan (Fig. 32).

#### *Kokeshia caii* sp. nov.

[urn:lsid:zoobank.org:act:F68DE9D8-F3D7-4583-9224-2807B7234F5C](https://doi.org/10.3896/BI.2020.103.1)

Figs 7–8, 26D, 28D, 32

#### Diagnosis

The male of *K. caii* sp. nov. is similar to *K. weirauchae* sp. nov., but can be recognized from the latter by the left lateral margin of the hemitergite VIII strongly concave from about  $\frac{1}{3}$  of its apex, and the apical portion of hemitergite VIII with a finger-shaped process, which without any thick spiniform microtrichia, and with numerous microtrichia which the apex split into 2 to 5 branches (Figs 7D–G, 8A–B).

#### Etymology

The species epithet is derived from and dedicated to Prof. Wanzhi Cai (College of Plant Protection, China Agricultural University, China), recognizing his contributions to the study of taxonomy, morphology and phylogeny of Heteroptera.

#### Material examined

##### Holotype

CHINA • ♂; Yunnan Province, Xishuangbanna, Menghai County, Gelanghe Town, Pazhen village; 21°51'10.37" N, 100°35'26.67" E; ca 1610 m a.s.l.; 27 Jul. 2019; Jiu-Yang Luo leg.; light trap; SYSBM.

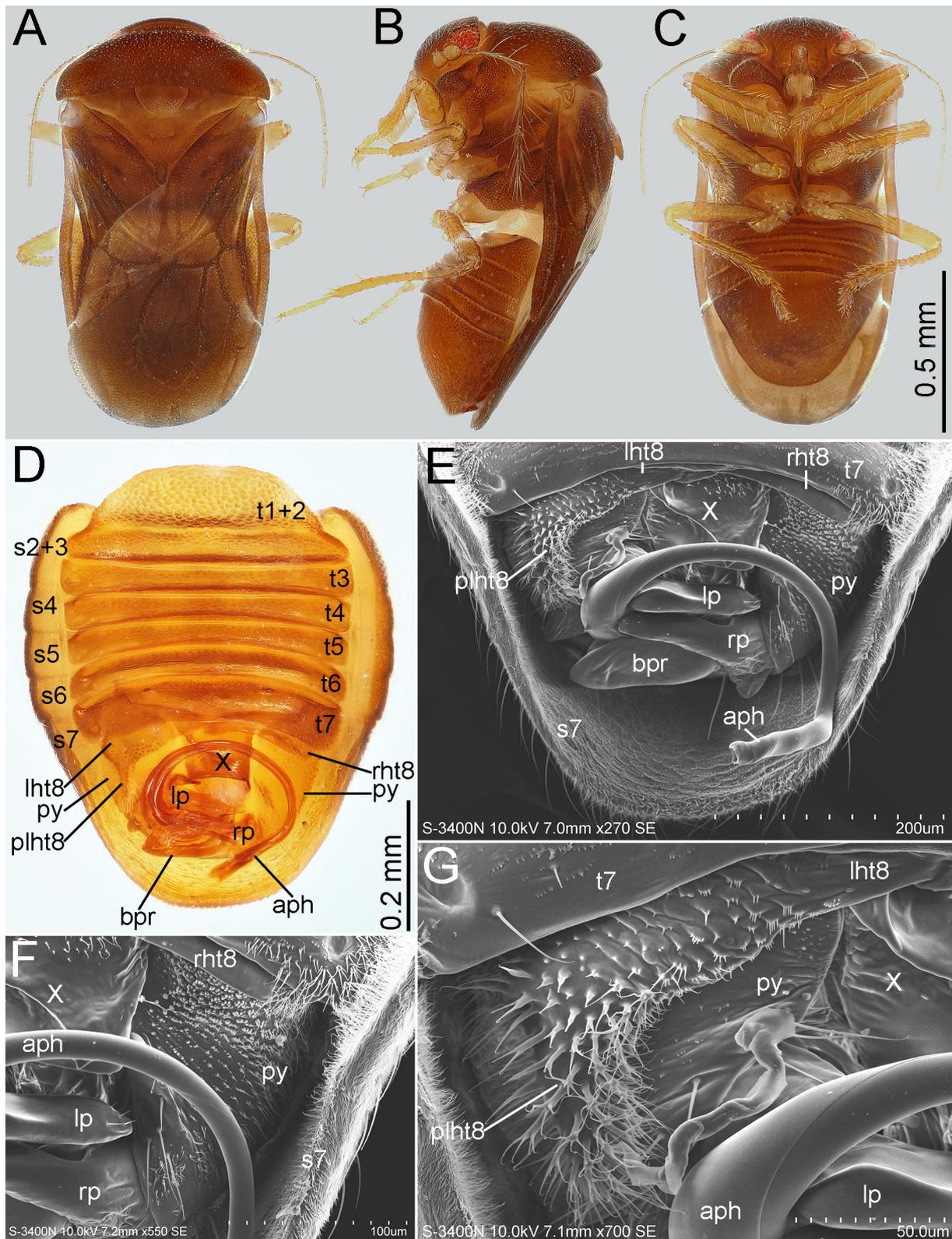
##### Paratypes

CHINA • 5 ♂♂; same collection data as for holotype; SYSBM.

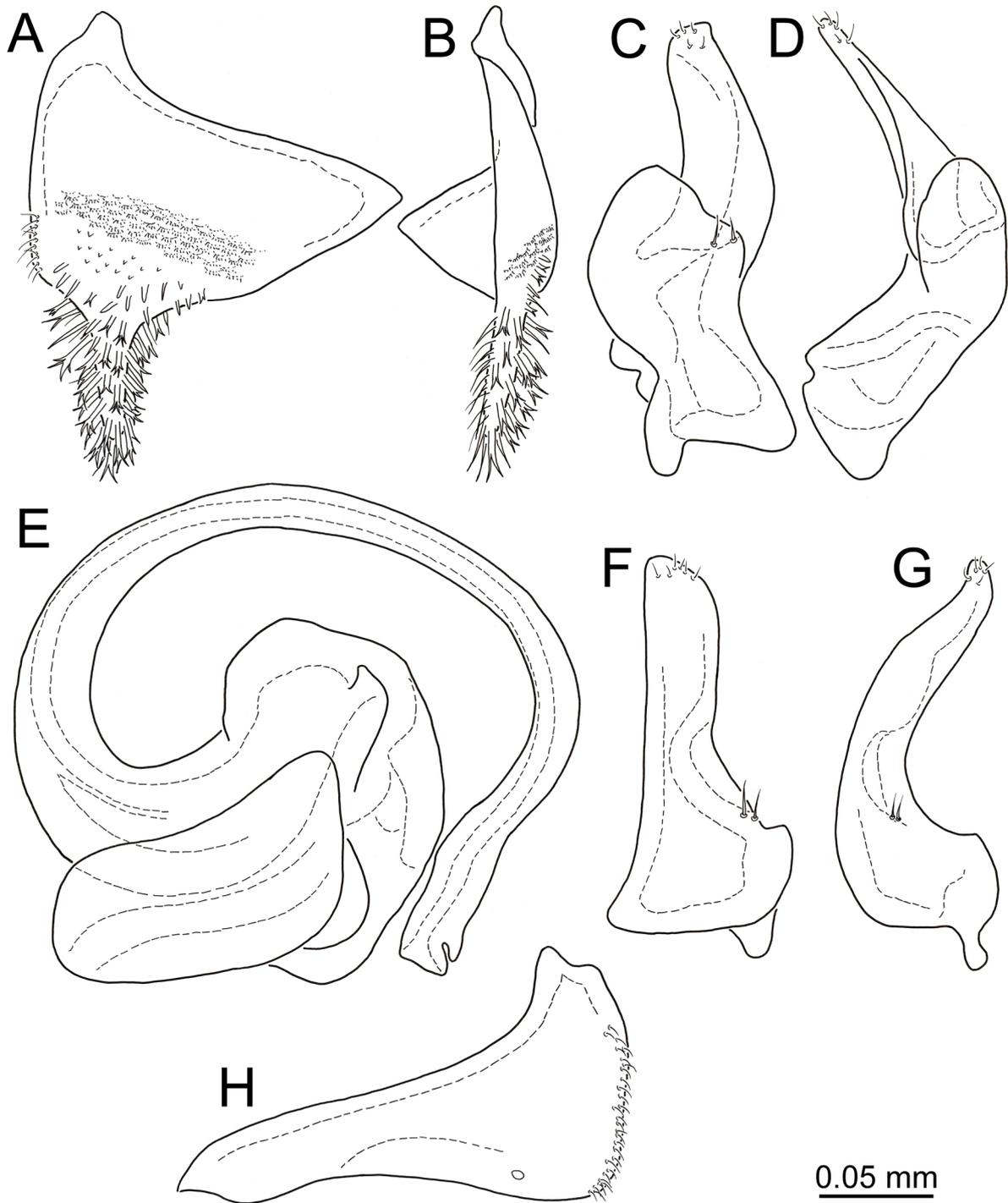
#### Description

##### Male

MEASUREMENTS (in mm) (male holotype / male paratypes, N = 5). Total body length 1.36 / 1.24–1.36; length of head 0.25 / 0.23–0.25, maximum width across eyes 0.39 / 0.37–0.40, interocular distance 0.27 / 0.26–0.28; length of antennal segment I 0.08 / 0.07–0.08, segment II 0.08 / 0.07–0.08, segment III 0.30 / 0.28–0.30, segment IV 0.34 / 0.31–0.34; length of labial segment I 0.07 / 0.07–0.08, segment II 0.06 / 0.05–0.06, segment III 0.04 / 0.04–0.05, segment IV 0.12 / 0.11–0.12; middle length of pronotum



**Fig. 7.** *Kokeshia caii* sp. nov. **A–C.** Habitus, holotype, ♂ (SYSBM). **A.** Dorsal view. **B.** Lateral view. **C.** Ventral view. **D.** Pregenital abdomen and genitalia, dorsal view, paratype, ♂ (SYSBM). **E–G.** Scanning electron micrographs of genitalia, paratype, ♂ (SYSBM). **E.** Dorsal view. **F.** Right side, dorsal view. **G.** Left side, dorsal view. Abbreviations: see Material and methods.



**Fig. 8.** *Kokeshia caii* sp. nov., segment VIII and genitalia, paratype, ♂ (SYSBM). **A–B.** left hemitergite VIII. **A.** Dorsal view. **B.** Left lateral view. **C–D.** Left paramere, two different aspects. **E.** Phallus. **F–G.** Right paramere, two different aspects. **H.** Right hemitergite VIII, dorsal view.

0.41 / 0.33–0.40, length of collar 0.06 / 0.06, humeral width 0.70 / 0.60–0.69; length of forewing 1.16 / 0.93–1.19; length of fore femur 0.30 / 0.31–0.33, fore tibia 0.35 / 0.33–0.35, fore tarsus 0.13 / 0.13; length of middle femur 0.35 / 0.34–0.38, middle tibia 0.36 / 0.33–0.35, middle tarsus 0.12 / 0.12–0.14; length of hind femur 0.37 / 0.38–0.41, hind tibia 0.58 / 0.55–0.58, hind tarsus 0.19 / 0.18–0.19; greatest width of abdomen 0.59 / 0.56–0.58.

MACROPTEROUS. Small sized (about 1.24–1.36 mm).

COLORATION. Body brown, appendages yellowish brown (Fig. 7A–C). Surface, vestiture and general structures as in generic description, except mentioned below.

HEAD. Interocular distance 0.68–0.71 × length of maximum width across eyes.

THORAX. Humeral width 1.69–1.82 × as long as middle length of pronotum. Venation of forewing in accordance with general pattern of genus. C+Sc, R+M, R and basal portion of 1An distinctly darker than wing surface, other veins darker than wing surface (Fig. 26D).

ABDOMEN. Tergite VII and sternite VII slightly asymmetrical. Tergite VIII subdivided into two hemitergites, left hemitergite VIII with finger-shaped process, and with numerous semi-erect, short to moderate long microtrichia on surface, and ends of these microtrichia split into 2 to 5 branches (similar to setae on process of hemitergite VIII of *K. bui*). Basal portion of process with scale-like projections, with 1 to 6 short microtrichia located on posterior margin of each one of them. Right hemitergite VIII simple, posterolateral portion round, projecting posteriad, outer margin with microtrichia (Figs 7E–F, 8H).

GENITALIA. Pygophore slightly asymmetrical, dorsal surface with groups of microtrichia on small, tightly connected projections, posterior area with relatively long setae. Parameres strongly asymmetrical, left paramere (Figs 7E, 8C–D) with broadly rounded laminate extension directed dorsal near base, and with flattened and elongate distal projection; right paramere (Figs 7E, 8F–G) with flattened and blunt distal projection. Apical portion of phallus (Figs 7D–E, 8E) tubular, forming nearly one complete coil outside of pygophore, apex thickened and forming a depression on one side.

#### **Female**

Unknown.

#### **Distribution**

China: Yunnan (Fig. 32).

#### ***Kokeshia drepanoides* sp. nov.**

[urn:lsid:zoobank.org:act:B310837E-53EA-4E34-B9E8-0E16DE44D4CA](https://zoobank.org/urn:lsid:zoobank.org:act:B310837E-53EA-4E34-B9E8-0E16DE44D4CA)

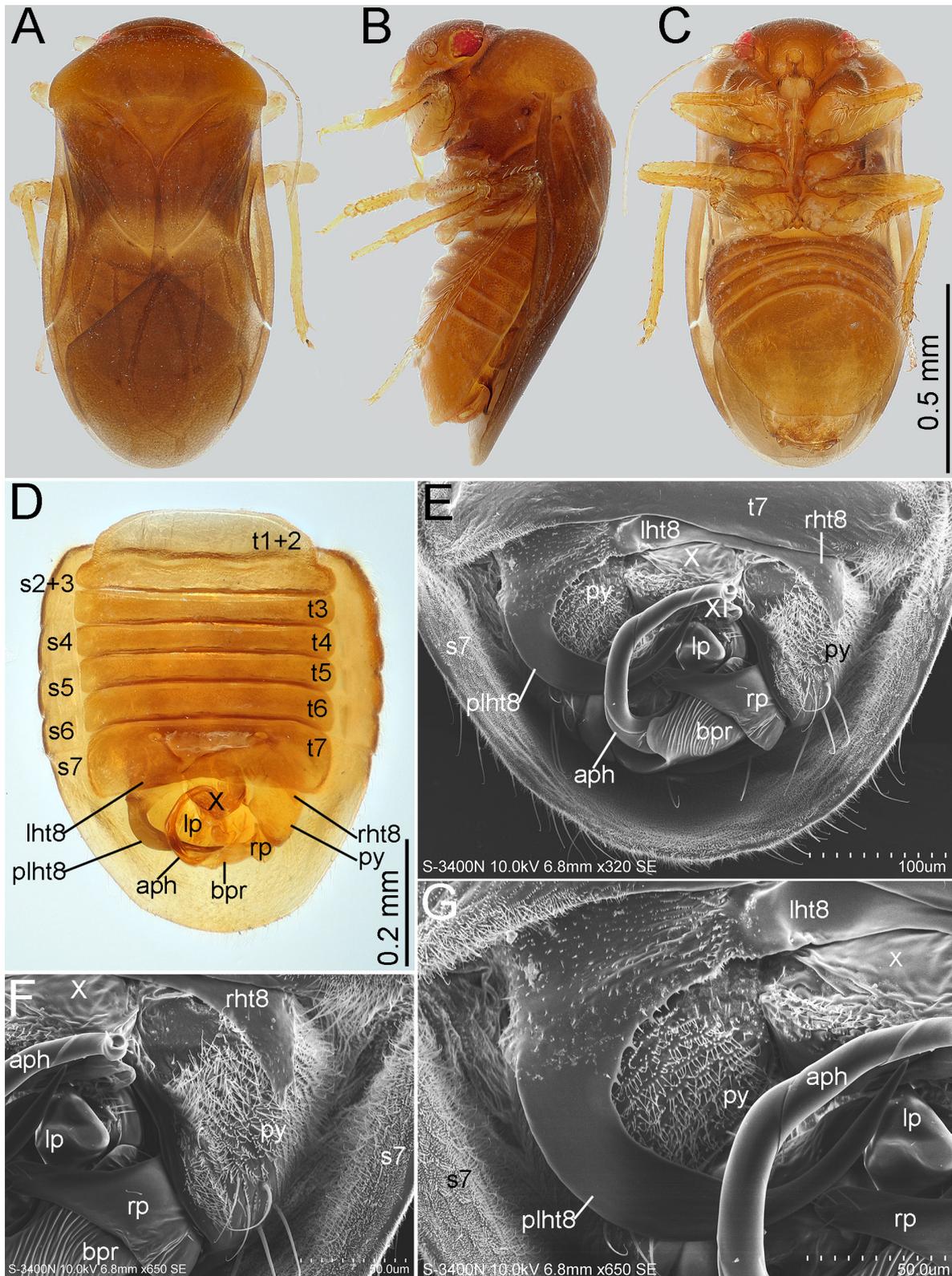
Figs 9–10, 26E, 29A, 32

#### **Diagnosis**

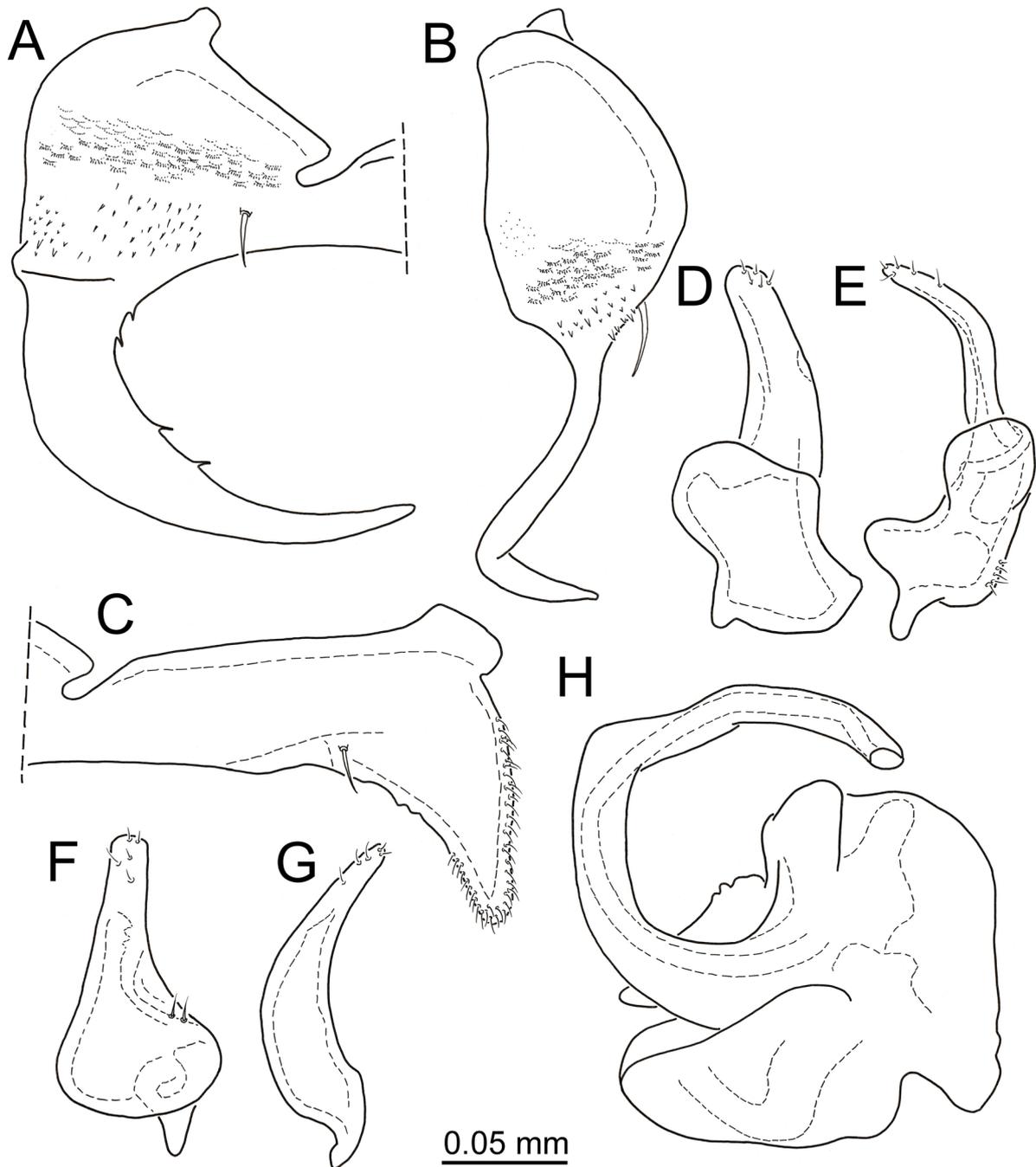
*Kokeshia drepanoides* sp. nov. can be recognized from all other species of *Kokeshia* by tergite VIII subdivided into two hemitergites, left hemitergite VIII with a flattened, curved, sickle-shaped process. (Figs 9D, E, G, 10A–B).

#### **Etymology**

The species epithet is derived from the Greek adjective ‘*drepanoides*’, means ‘sickle-shaped’, and refers to the curved, sickle-shaped process of tergite VIII.



**Fig. 9.** *Kokeshia drepanoides* sp. nov. **A–C.** Habitus, holotype, ♂ (NKUM). **A.** Dorsal view. **B.** Lateral view. **C.** Ventral view. **D.** Pregenital abdomen and genitalia, dorsal view, paratype, ♂ (SYSBM). **E–G.** Scanning electron micrographs of genitalia, paratype, ♂ (SYSBM). **E.** Dorsal view. **F.** Right side, dorsal view. **G.** Left side, dorsal view. Abbreviations: see Material and methods.



**Fig. 10.** *Kokeshia drepanoides* sp. nov., segment VIII and genitalia, paratype, ♂ (SYSBM). **A–B.** Left hemitergite VIII. **A.** Dorsal view. **B.** Left lateral view. **C.** Right hemitergite VIII, dorsal view. **D–E.** Left paramere, two different aspects. **F–G.** Right paramere, two different aspects. **H.** Phallus.

## Material examined

### Holotype

CHINA • ♂; Yunnan Province, Honghe, Jinping County, Adebo Town; 22°54'21" N, 103°13'49" E; ca 1480 m a.s.l.; 30 Jul. 2016; Jiu-Yang Luo leg.; NKUM.

### Paratypes

CHINA • 7 ♂♂; same collection data as for holotype; SYSBM.

## Description

### Male

MEASUREMENTS (in mm) (male holotype / male paratypes, N = 5). Total body length 1.27 / 1.20–1.31; length of head 0.22 / 0.19–0.23, maximum width across eyes 0.36 / 0.36–0.37, interocular distance 0.25 / 0.24–0.25; length of antennal segment I 0.07 / 0.06–0.07, segment II 0.07 / 0.07, segment III 0.27 / 0.29–0.30, segment IV 0.33 / 0.32–0.33; length of labial segment I 0.07 / 0.07–0.08, segment II 0.05 / 0.04–0.05, segment III 0.03 / 0.04, segment IV 0.11 / 0.10–0.12; middle length of pronotum 0.34 / 0.35–0.37, length of collar 0.05 / 0.05–0.06, humeral width 0.60 / 0.61–0.63; length of forewing 1.16 / 1.07–1.15; length of fore femur 0.27 / 0.29–0.30, fore tibia 0.33 / 0.31–0.33, fore tarsus 0.12 / 0.12–0.13; length of middle femur 0.34 / 0.32–0.34, middle tibia 0.34 / 0.30–0.35, middle tarsus 0.11 / 0.11–0.12; length of hind femur 0.33 / 0.36–0.38, hind tibia 0.56 / 0.54–0.56, hind tarsus 0.17 / 0.17–0.18; greatest width of abdomen 0.55 / 0.52–0.55.

MACROPTEROUS. Small sized (about 1.2–1.31 mm).

COLORATION. Body light brown to brown, appendages yellowish brown (Fig. 9A–C). Surface, vestiture and general structures as in generic description, except mentioned below.

HEAD. Interocular distance  $0.67\text{--}0.69 \times$  length of maximum width across eyes.

THORAX. Humeral width  $1.69\text{--}1.77 \times$  as long as middle length of pronotum. Venation of forewing in accordance with general pattern of genus. C+Sc, R+M, R and basal portion of 1An darker than wing surface, other veins slightly darker than wing surface (Fig. 26E).

ABDOMEN. Tergite VII and sternite VII slightly asymmetrical. Tergite VIII subdivided into two hemitergites, left hemitergite VIII with a flattened, curved, sickle-shaped process, and horizontally directed mesad; prominent setae near its inner margin (Figs 9D–E, G, 10A–B). Right hemitergite VIII simple, posterolateral portion elongated subtrapezoidal, projecting posteriad, prominent setae near posterior margin (Figs 9E–F, 10C).

GENITALIA. Pygophore asymmetrical, dorsal surface with rows of microtrichia on transverse projections, posterior margin with curved setae. Parameres strongly asymmetrical, left paramere (Figs 9E, 10D–E) with broadly rounded laminate extension directed dorsal near base, and with flattened and elongate distal projection, and curved inward from middle of it; right paramere (Figs 9E, 10F–G) with flattened, blunt and relatively slender distal projection. Apical portion of phallus (Figs 9D–E, 10E) tubular, short, forming half coil outside of pygophore, with triangular laminate at middle portion.

### Female

Unknown.

## Distribution

China: Yunnan (Fig. 32).

*Kokeshia hilli* sp. nov.

[urn:lsid:zoobank.org:act:F4BD7B25-53B1-4726-9925-AE8E51FA4210](https://zoobank.org/urn:lsid:zoobank.org:act:F4BD7B25-53B1-4726-9925-AE8E51FA4210)

Figs 11–12, 26F, 29B, 32

**Diagnosis**

*Kokeshia hilli* sp. nov. can be recognized from all other species of *Kokeshia* by tergite VIII subdivided into two hemitergites, left hemitergite VIII introduced into a flattened, nearly quadrangular process, left posterolateral margin of the process with a raised projection, which bearing about 7 thick, basal-curved spiniform microtrichia; right posterolateral margin of the process with about seven parallel, thick, basal-curved spiniform microtrichia. Right hemitergite VIII with a long, rodlike process projecting posteriad (Figs 11D–E, G, 12A–B).

**Etymology**

The species epithet is derived from and dedicated to Mr Lionel Hill (Tasmanian Department of Primary Industry, Water and Environment, Australia), recognizing his contributions to the study of taxonomy of Dipsocoromorpha (mainly in the Australian region).

**Material examined**

**Holotype**

CHINA • ♂; Yunnan Province, Honghe, Jinping County, Adebo Town; 22°54'21" N, 103°13'49" E; ca 1480 m a.s.l.; 31 Jul. 2016; Jiu-Yang Luo leg.; NKUM.

**Paratypes**

CHINA • 4 ♂♂; same collection data as for holotype; SYSBM.

**Description**

**Male**

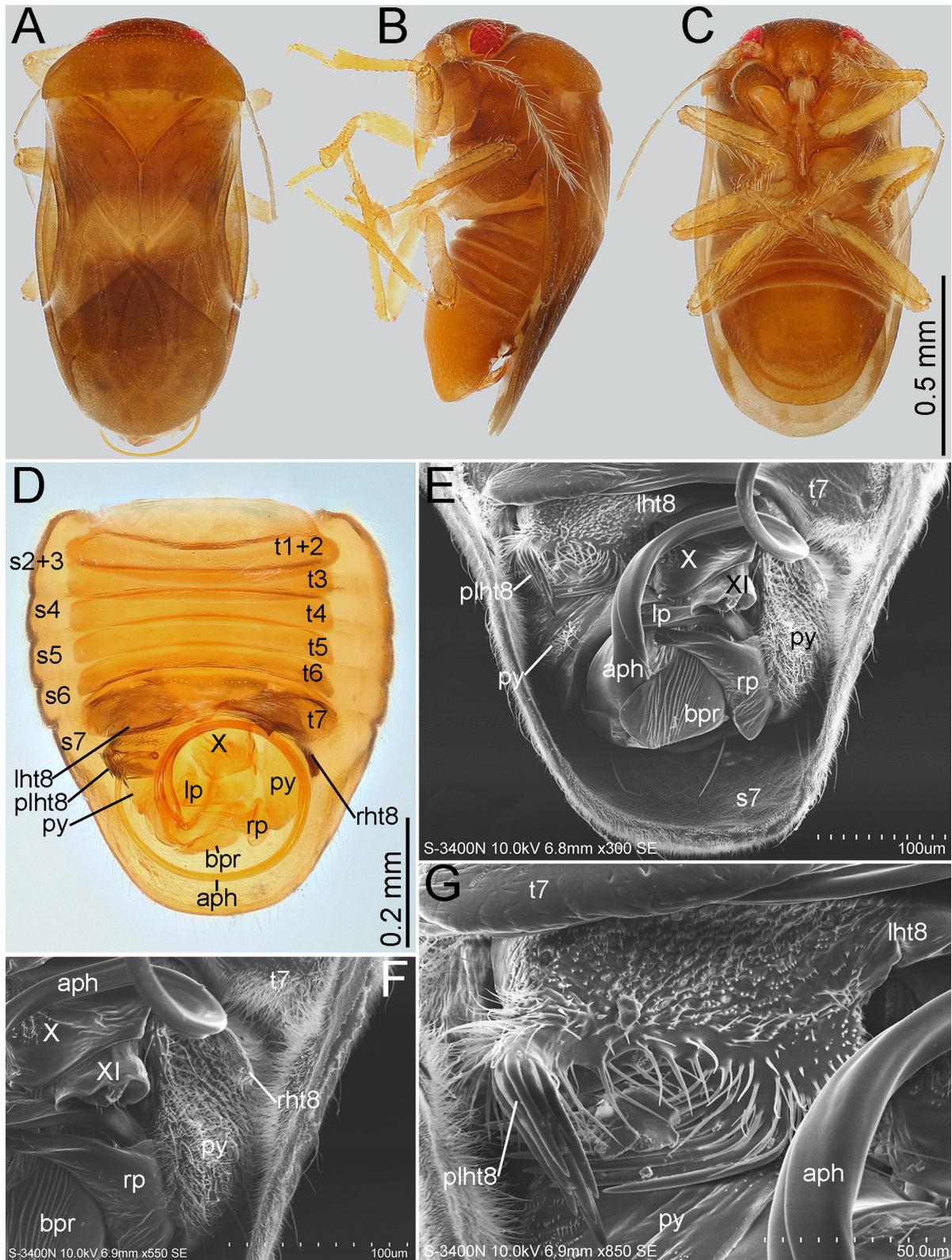
MEASUREMENTS (in mm) (male holotype / male paratypes, N = 4). Total body length 1.22 / 1.25–1.36; length of head 0.24 / 0.21–0.24, maximum width across eyes 0.37 / 0.38–0.40, interocular distance 0.25 / 0.23–0.24; length of antennal segment I 0.06 / 0.07–0.08, segment II 0.07 / 0.07–0.08, segment III 0.30 / 0.30, segment IV 0.33 / 0.32; length of labial segment I 0.07 / 0.07–0.08, segment II 0.06 / 0.04–0.05, segment III 0.05 / 0.03–0.05, segment IV 0.11 / 0.09–0.12; middle length of pronotum 0.35 / 0.33–0.36, length of collar 0.06 / 0.06–0.07, humeral width 0.62 / 0.62; length of forewing 1.07 / 1.08–1.14; length of fore femur 0.32 / 0.29–0.31, fore tibia 0.34 / 0.32–0.34, fore tarsus 0.12 / 0.12–0.13; length of middle femur 0.34 / 0.32–0.35, middle tibia 0.34 / 0.34–0.35, middle tarsus 0.12 / 0.11–0.12; length of hind femur 0.36 / 0.35–0.41, hind tibia 0.56 / 0.52–0.57, hind tarsus 0.18 / 0.17–0.19; greatest width of abdomen 0.55 / 0.54–0.56.

MACROPTEROUS. Small sized (about 1.22–1.36 mm).

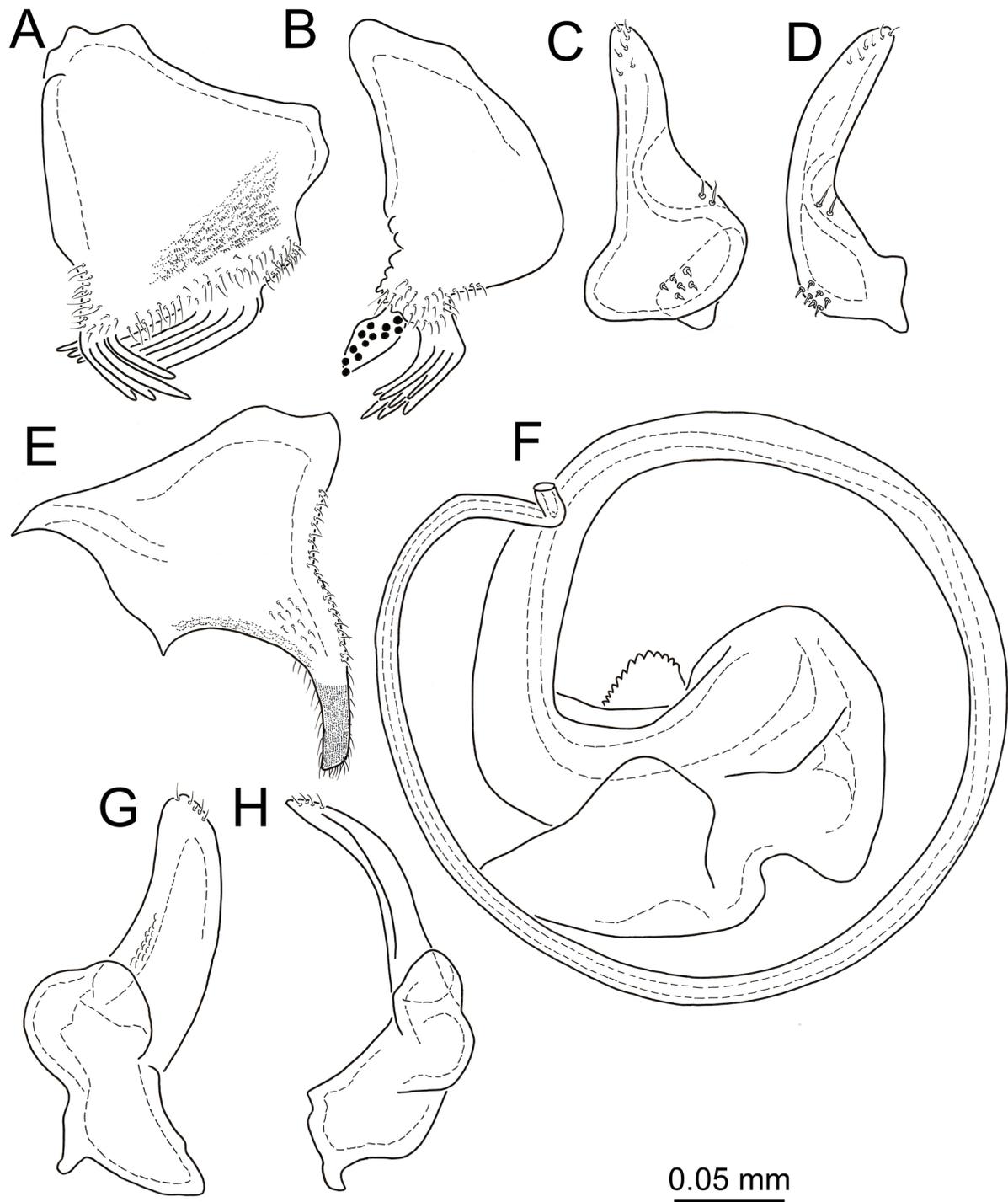
COLORATION. Body brown, appendages yellowish brown (Fig. 11A–C). Surface, vestiture and general structures as in generic description, except mentioned below.

HEAD. Interocular distance 0.58–0.68 × length of maximum width across eyes.

THORAX. Humeral width 1.72–1.88 × as long as middle length of pronotum. Venation of forewing in accordance with general pattern of genus. C+Sc, R+M, R and basal portion of 1An darker than wing surface, other veins slightly darker than wing surface (Fig. 26F).



**Fig. 11.** *Kokeshia hilli* sp. nov. A–C. Habitus, holotype, ♂ (NKUM). A. Dorsal view. B. Lateral view. C. Ventral view. D. Pregenital abdomen and genitalia, dorsal view, paratype, ♂ (SYSBM). E–G. Scanning electron micrographs of genitalia, paratype, ♂ (SYSBM). E. Dorsal view. F. Right side, dorsal view. G. Left side, dorsal view. Abbreviations: see Material and methods.



**Fig. 12.** *Kokeshia hilli* sp. nov., segment VIII and genitalia, paratype, ♂ (SYSBM). **A–B.** Left hemitergite VIII. **A.** Dorsal view. **B.** Left lateral view. **C–D.** Right paramere, two different aspects. **E.** Right hemitergite VIII, dorsal view. **F.** Phallus. **G–H.** Left paramere, two different aspects.

ABDOMEN. Tergite VII and sternite VII slightly asymmetrical. Tergite VIII subdivided into two hemitergites, posterior margin of left hemitergite VIII (Figs 11D–E, G, 12A–B) introduced into flattened, nearly quadrangular process, left posterolateral margin with raised projection, bearing about 7 thick, basal-curved spiniform microtrichia; right posterolateral margin of process with about 7 parallel, thick, basal-curved spiniform microtrichia. Basal portion of process with numerous small round pits and microteeth. Right hemitergite VIII with long, stick shaped process projecting posteriad (Figs 11E–F, 12E).

GENITALIA. Pygophore slightly asymmetrical, dorsal surface with dense microtrichia, posterior area with relatively long setae. Parameres strongly asymmetrical, left paramere (Figs 11E, 12G–H) with broadly blunt laminate extension directed dorsal near base, and with flattened and relatively broad distal projection, and slightly curved inward from middle of it; right paramere (Figs 11E, 12C–D) with flattened, round and relatively slender distal projection. Apical portion of phallus (Figs 11D–E, 12F) tubular, slender, forming less than one and a half coils outside of pygophore.

#### **Female**

Unknown.

#### **Distribution**

China: Yunnan (Fig. 32).

*Kokeshia hsiao* Ren & Zheng, 1992  
Figs 13–14, 26G, 29C, 32

*Kokeshia hsiao* Ren & Zheng, 1992: 191 (original description).

*Kokeshia hsiao* – Rédei 2008: 249 (in key).

#### **Diagnosis**

*Kokeshia hsiao* can be recognized from all other species of *Kokeshia* by tergite VIII subdivided into two hemitergites, left hemitergite VIII with an elongate, slender, curved process with an appendage split into 3–5 branches (Figs 13D–E, G, 14A–B).

#### **Material examined**

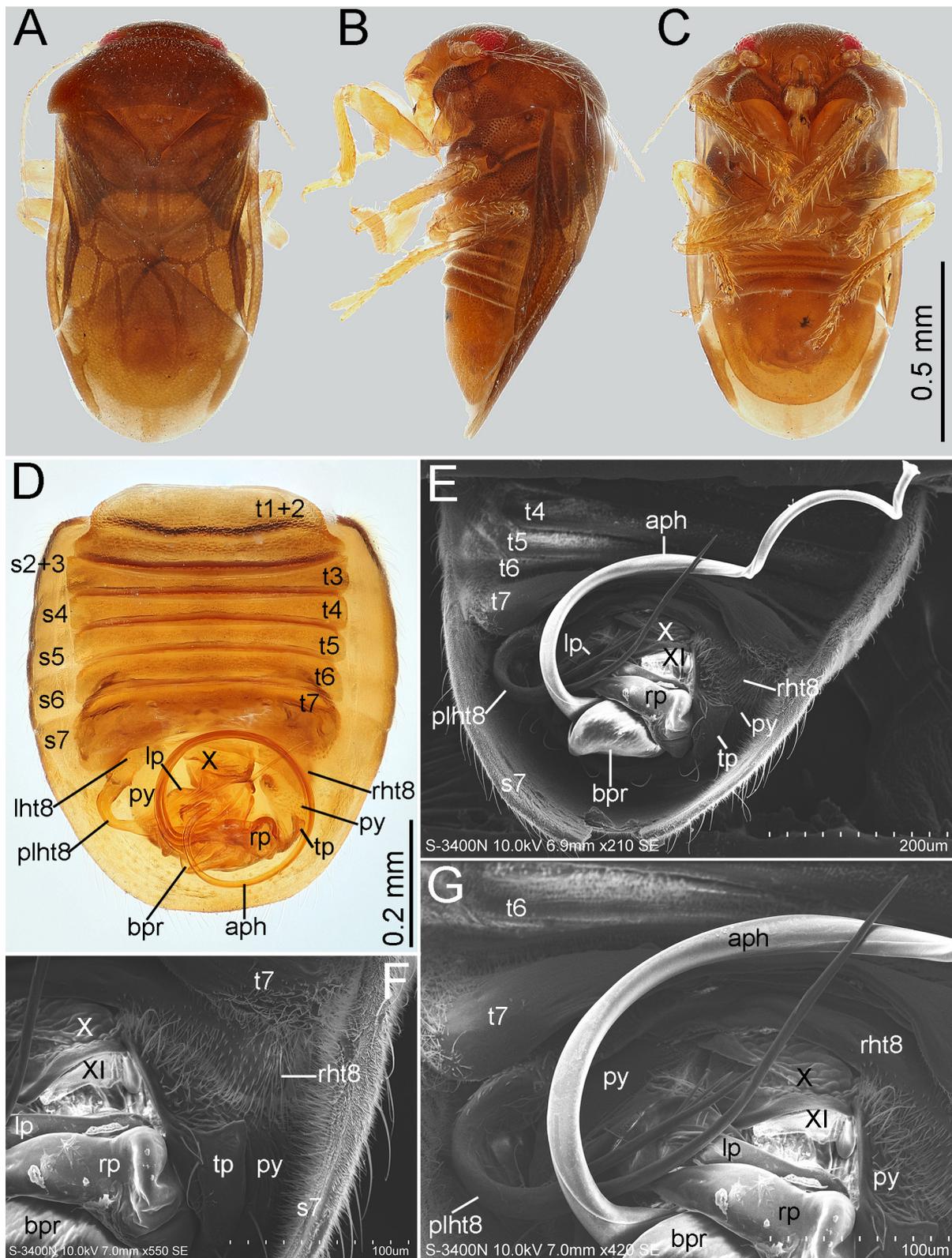
CHINA • 3 ♂♂; Guangdong Province, Zhaoqing City, Huaiji County, Yueshan Forest Farm; 24°13'1.17" N, 111°57'49.13" E; ca 430 m a.s.l.; 27 Jul. 2018; Qiang Xie and Xiao-Ya Sun leg.; light trap; SYSBM.

#### **Redescription**

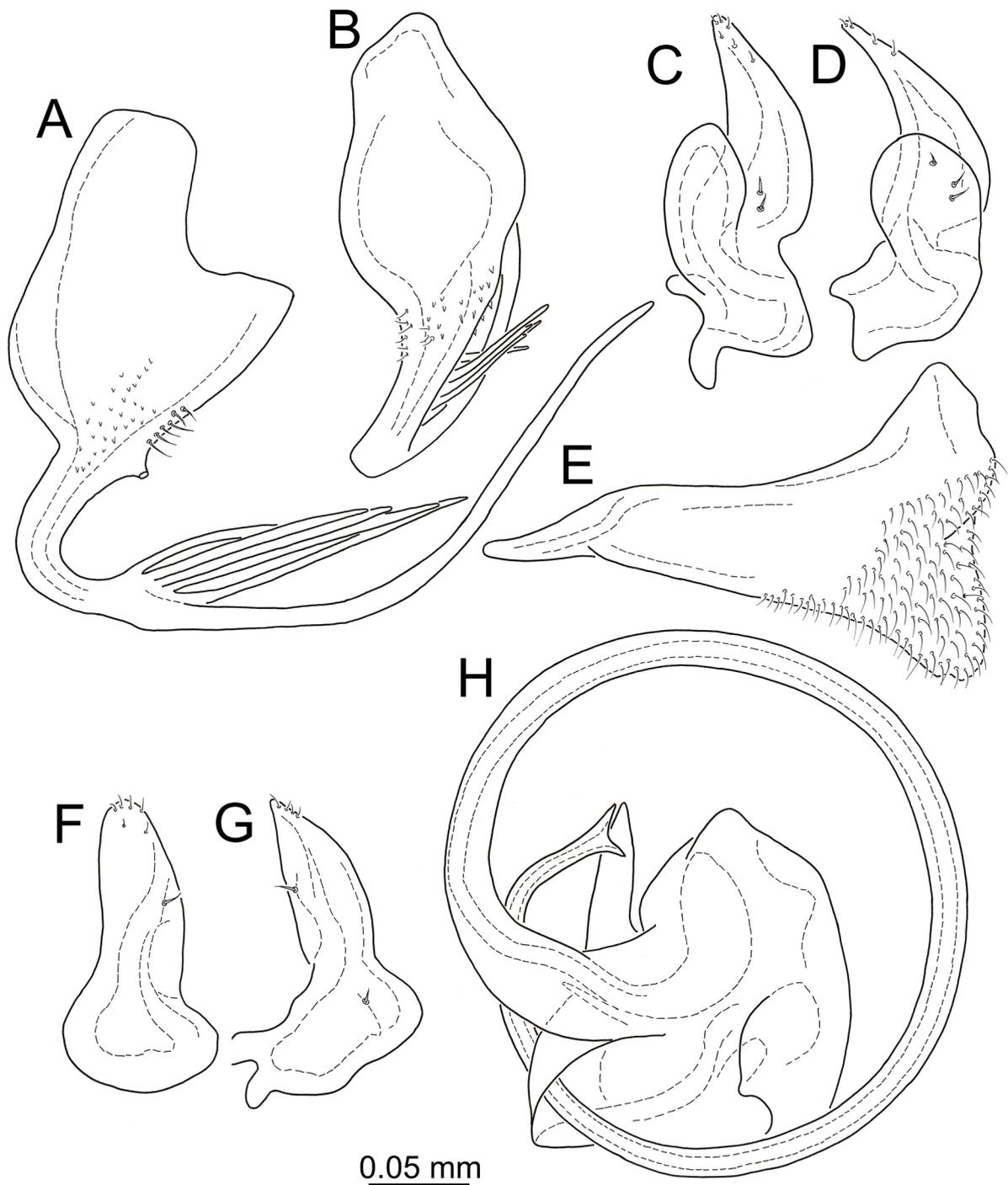
##### **Male**

MEASUREMENTS (in mm) (male non-type specimens, N = 3). Total body length 1.18–1.29; length of head 0.24–0.26, maximum width across eyes 0.38–0.41, interocular distance 0.26–0.28; length of antennal segment I 0.07–0.08, segment II 0.07–0.08, segment III 0.30, segment IV 0.34; length of labial segment I 0.08–0.09, segment II 0.05–0.06, segment III 0.06–0.07, segment IV 0.09–0.10; middle length of pronotum 0.37–0.40, length of collar 0.06–0.07, humeral width 0.65–0.68; length of forewing 1.09–1.17; length of fore femur 0.29–0.33, fore tibia 0.33–0.35, fore tarsus 0.12–0.13; length of middle femur 0.32–0.36, middle tibia 0.33–0.35, middle tarsus 0.13; length of hind femur 0.38–0.41, hind tibia 0.53–0.60, hind tarsus 0.17–0.18; greatest width of abdomen 0.54–0.56.

MACROPTEROUS. Small sized (about 1.18–1.29 mm).



**Fig. 13.** *Kokeshia hsiao* Ren & Zheng, 1992. **A–C.** Habitus, ♂ (SYSBM). **A.** Dorsal view. **B.** Lateral view. **C.** Ventral view. **D.** Pregenital abdomen and genitalia, dorsal view, ♂ (SYSBM). **E–G.** Scanning electron micrographs of genitalia, ♂ (SYSBM). **E.** Dorsal view. **F.** Right side, dorsal view. **G.** Left side, dorsal view. Abbreviations: see Material and methods.



**Fig. 14.** *Kokeshia hsiaoi* Ren & Zheng, 1992, segment VIII and genitalia, ♂ (SYSBM). **A–B.** Left hemitergite VIII. **A.** Dorsal view. **B.** Left lateral view. **C–D.** Left paramere, two different aspects. **E.** Right hemitergite VIII, dorsal view. **F–G.** Right paramere, two different aspects. **H.** Phallus.

**COLORATION.** Body yellowish brown to light brown, appendages yellowish brown (Fig. 13A–C). Surface, vestiture and general structures as in generic description, except mentioned below.

**HEAD.** Interocular distance  $0.66\text{--}0.70 \times$  length of maximum width across eyes.

**THORAX.** Humeral width  $1.69\text{--}1.76 \times$  as long as middle length of pronotum. Venation of forewing in accordance with general pattern of genus. C+Sc, R+M, R and basal portion of 1An darker than wing surface, other veins slightly darker than wing surface (Fig. 26G).

**ABDOMEN.** Tergite VII slightly asymmetrical, right portion wider than left portion, sternite VII nearly symmetrical. tergite VIII subdivided into two hemitergites, left hemitergite VIII with elongate, slender, curved process with appendage split into 3–5 branches, its inner margin with large, prominent process (Figs 13D–E, G, 14A).

**GENITALIA.** Pygophore simple, asymmetrical, dorsal surface with dense microtrichia. Posterior margin of right dorsum with a triangular process (Fig. 13 D–F), which function might be to fix position of phallus. posterior area with about twelve relatively long setae. Parameres strongly asymmetrical, left paramere (Figs 13E, 14C–D) with broadly rounded laminate extension directed dorsal near base, and with flattened and tapering distal projection, and curved inward; right paramere (Figs 13E, 14F–G) with flattened, round and relatively slender distal projection. Apical portion of phallus (Figs 13D–E, 14H) tubular, slender, forming more than one coil outside of pygophore.

#### **Female**

Unknown.

#### **Distribution**

China: Guangdong, Zhejiang (Fig.20).

*Kokeshia pengae* sp. nov.

[urn:lsid:zoobank.org:act:85B2D5C7-6449-4606-BF7E-19DA4285CCBF](https://doi.org/10.3896/abris.2022.802.1.1)

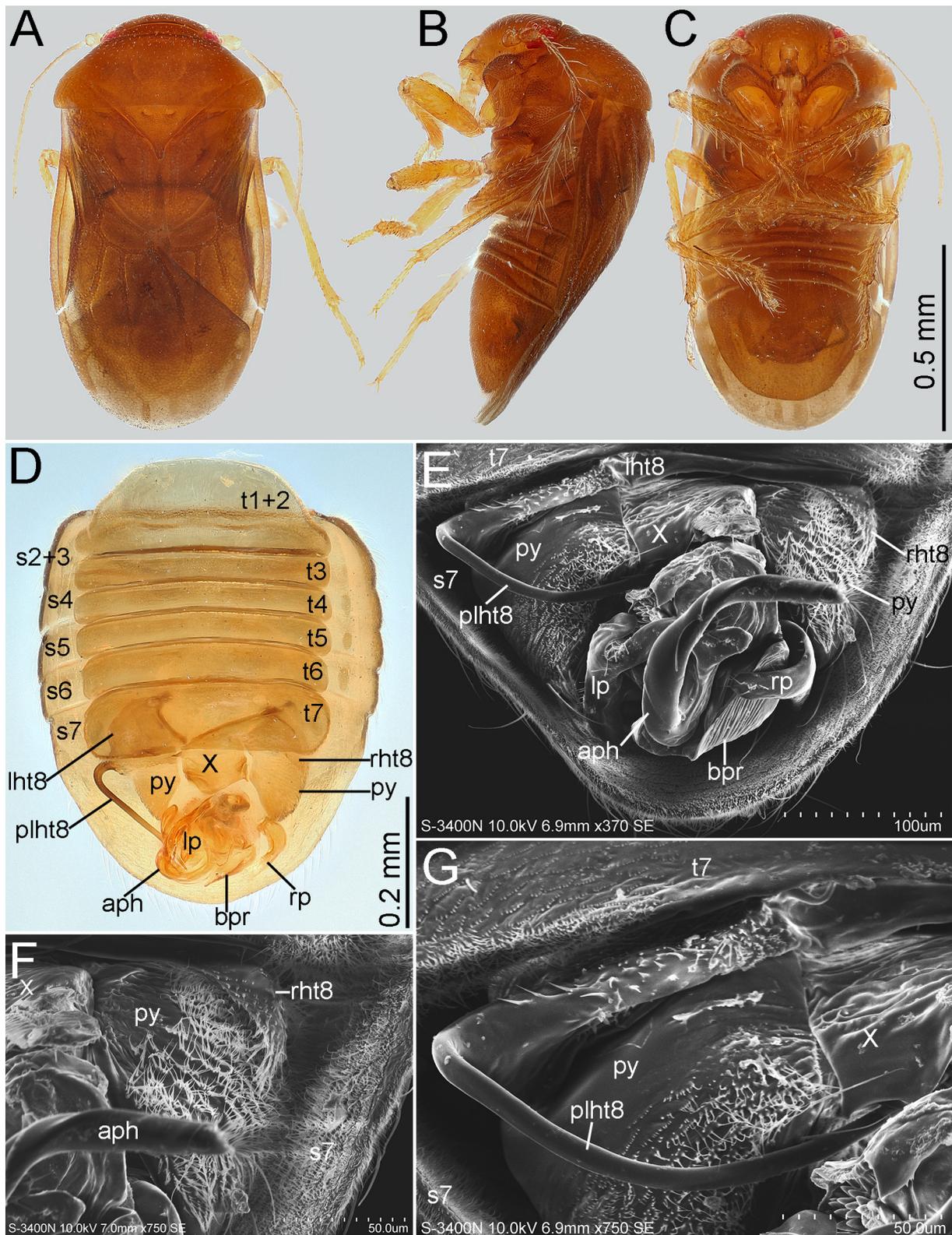
Figs 15–16, 26H, 29D, 32

#### **Diagnosis**

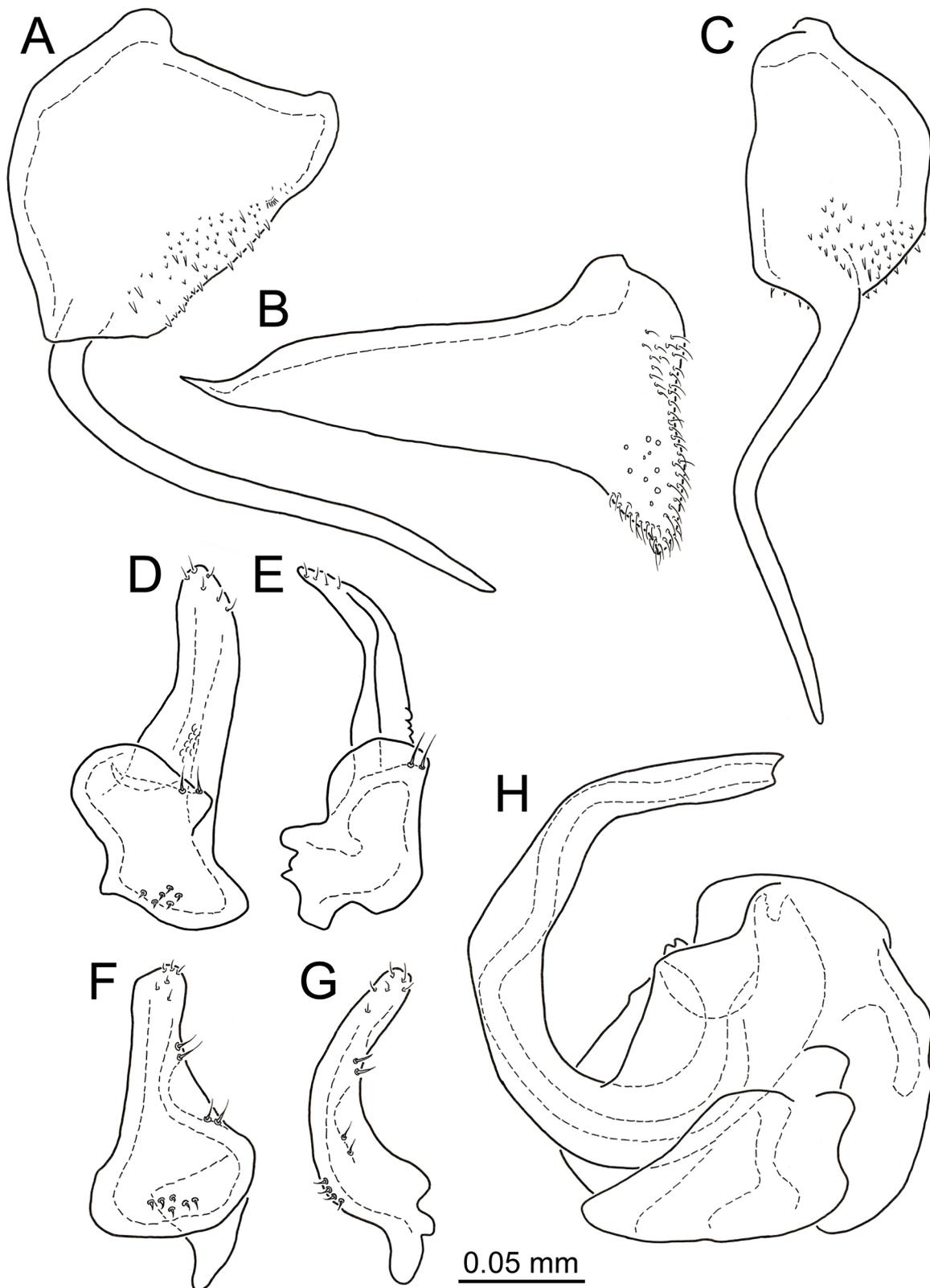
The male of *K. pengae* sp. nov. is similar to *K. oroszi*, but can be distinguished from the latter species by an obviously large body size  $1.20\text{--}1.29$  mm, whereas  $1.04$  in *K. oroszi*; process of left hemitergite VIII flagelliform, produced from left margin of left hemitergite VIII, whereas in *K. oroszi*, process of left hemitergite VIII flagelliform, produced from posterior margin of left hemitergite VIII; apical portion of phallus short, slightly curved, forming about a half coil outside of pygophore, whereas in *K. oroszi*, apical portion of phallus longer and curved, forming about one incomplete coil outside of pygophore.

#### **Etymology**

The species epithet is derived from and dedicated to Prof. Yanqiong Peng (Key Laboratory of Tropical Forest Ecology, Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences, China), appreciating her kind help during our field works in Xishuangbanna and recognizing her contributions to the study of co-evolution of fig and fig wasps.



**Fig. 15.** *Kokeshia pengae* sp. nov. **A–C.** Habitus, holotype, ♂ (SYSBM). **A.** Dorsal view. **B.** Lateral view. **C.** Ventral view. **D.** Pregenital abdomen and genitalia, dorsal view, paratype, ♂ (SYSBM). **E–G.** Scanning electron micrographs of genitalia, paratype, ♂ (SYSBM). **E.** Dorsal view. **F.** Right side, dorsal view. **G.** Left side, dorsal view. Abbreviations: see Material and methods.



**Fig. 16.** *Kokeshia pengae* sp. nov., segment VIII and genitalia, paratype, ♂ (SYSBM). **A, C.** Left hemitergite VIII. **A.** Dorsal view. **C.** Left lateral view. **B.** Right hemitergite VIII, dorsal view. **D–E.** Left paramere, two different aspects. **F–G.** Right paramere, two different aspects. **H.** Phallus.

## Material examined

### Holotype

CHINA • ♂; Yunnan Province, Xishuangbanna, Mengla County, Menglun Town, XTBG; 21°56'6.06" N, 101°15'8.18" E; ca 570 m a.s.l.; 19 Jul. 2019; Jiu-Yang Luo leg.; SYSBM.

### Paratypes

CHINA • 3 ♂♂; same collection data as for holotype; SYSBM.

## Description

### Male

MEASUREMENTS (in mm) (male holotype / male paratypes, N = 3). Total body length 1.20 / 1.20–1.29; length of head 0.21 / 0.18–0.19, maximum width across eyes 0.35 / 0.34–0.35, interocular distance 0.25 / 0.22–0.25; length of antennal segment I 0.08 / 0.07, segment II 0.08 / 0.07–0.08, segment III 0.30 / 0.29, segment IV 0.30 / 0.31–0.35; length of labial segment I 0.06 / 0.07, segment II 0.04 / 0.05, segment III 0.04 / 0.04–0.05, segment IV 0.10 / 0.11; middle length of pronotum 0.37 / 0.32–0.33, length of collar 0.06 / 0.05–0.06, humeral width 0.60 / 0.56–0.59; length of forewing 1.05 / 1.04–1.10; length of fore femur 0.30 / 0.29–0.32, fore tibia 0.33 / 0.31–0.33, fore tarsus 0.11 / 0.12–0.13; length of middle femur 0.31 / 0.30–0.32, middle tibia 0.30 / 0.33–0.34, middle tarsus 0.13 / 0.11–0.12; length of hind femur 0.38 / 0.34–0.37, hind tibia 0.55 / 0.52–0.53, hind tarsus 0.18 / 0.17–0.18; greatest width of abdomen 0.51 / 0.50–0.55.

MACROPTEROUS. Small sized (about 1.20–1.29 mm).

COLORATION. Body light brown to brown, appendages yellowish brown (Fig. 15A–C). Surface, vestiture and general structures as in generic description, except mentioned below.

HEAD. Interocular distance  $0.63\text{--}0.74 \times$  length of maximum width across eyes.

THORAX. Humeral width  $1.62\text{--}1.84 \times$  as long as middle length of pronotum. Venation of forewing in accordance with general pattern of genus. C+Sc, R+M, R and basal portion of 1An darker than wing surface, other veins slightly darker than wing surface (Fig. 26H).

ABDOMEN. Tergite VII and sternite VII slightly asymmetrical. Tergite VIII subdivided into two hemitergites, left hemitergite VIII with slender needle-shaped process, curved from base (Figs 15D–E, G, 16A, C). Basal portion of process with sparsely microtrichia. Right hemitergite VIII with long, triangular posterolateral portion projecting posteriad, bearing microtrichia at apex (Figs 15E–F, 16B).

GENITALIA. Pygophore simple, asymmetrical, dorsal surface with dense microtrichia, posterior area with relatively long setae. Parameres strongly asymmetrical, left paramere (Figs 15E, 16D–E) with broadly rounded laminate extension directed dorsal near base, and with flattened and tapering distal projection, and curved inward; right paramere (Figs 15E, 16F–G) with flattened, round and relatively slender distal projection. Apical portion of phallus (Figs 15D–E, 16H) tubular, short, forming about  $\frac{1}{2}$  coil outside of pygophore.

### Female

Unknown.

## Distribution

Yunnan Province, China (Fig. 20).

*Kokeshia redeii* sp. nov.

[urn:lsid:zoobank.org:act:B7AC7720-77E7-4DB3-9FD3-BB516BAEDE60](https://doi.org/10.3897/ejt.802.7720)

Figs 17–18, 27A, 30A, 32

**Diagnosis**

*Kokeshia redeii* sp. nov. can be recognized from all other species of *Kokeshia* by tergite VIII subdivided into two hemitergites, left hemitergite VIII with a flattened, slender, curved, sword-shaped process, horizontally directed mesad (Figs 17D–E, G, 18A).

**Etymology**

The species epithet is derived and dedicated to Dr Rédei Dávid (NCHU) recognizing his contributions to the study of taxonomy and morphology of Dipsocoromorpha and Heteroptera.

**Material examined**

**Holotype**

CHINA • ♂; Yunnan Province, Xishuangbanna, Mengla County, Menglun Town, Baka village; 21°57'58" N, 101°12'33" E; ca 580 m a.s.l.; 13 May. 2019; Qiang Xie leg.; SYSBM.

**Paratypes**

CHINA • 3 ♂♂; same collection data as for holotype; SYSBM.

**Description**

**Male**

MEASUREMENTS (in mm) (male holotype / male paratype, N = 3). Total body length 1.23 / 1.19–1.25; length of head 0.24 / 0.23–0.26, maximum width across eyes 0.32 / 0.31–0.32, interocular distance 0.25 / 0.24–0.25; length of antennal segment I 0.06 / 0.06, segment II 0.07 / 0.06–0.07, segment III unknown, segment IV unknown; length of labial segment I 0.08 / 0.06–0.08, segment II 0.05 / 0.05–0.06, segment III 0.05 / 0.04, segment IV 0.10 / 0.10; middle length of pronotum 0.31 / 0.31 / 0.32, length of collar 0.06 / 0.05–0.6, humeral width 0.57 / 0.56–0.58; length of forewing 1.10 / 1.06–1.08; length of fore femur 0.30 / 0.28–0.29, fore tibia 0.29 / 0.27–0.29, fore tarsus 0.12 / 0.11–0.12; length of middle femur 0.31 / 0.29–0.32, middle tibia 0.27 / 0.28–0.30, middle tarsus 0.12 / 0.11–0.12; length of hind femur 0.37 / 0.35–0.36, hind tibia 0.47 / 0.46–0.49, hind tarsus 0.18 / 0.17; greatest width of abdomen 0.47 / 0.46–0.52.

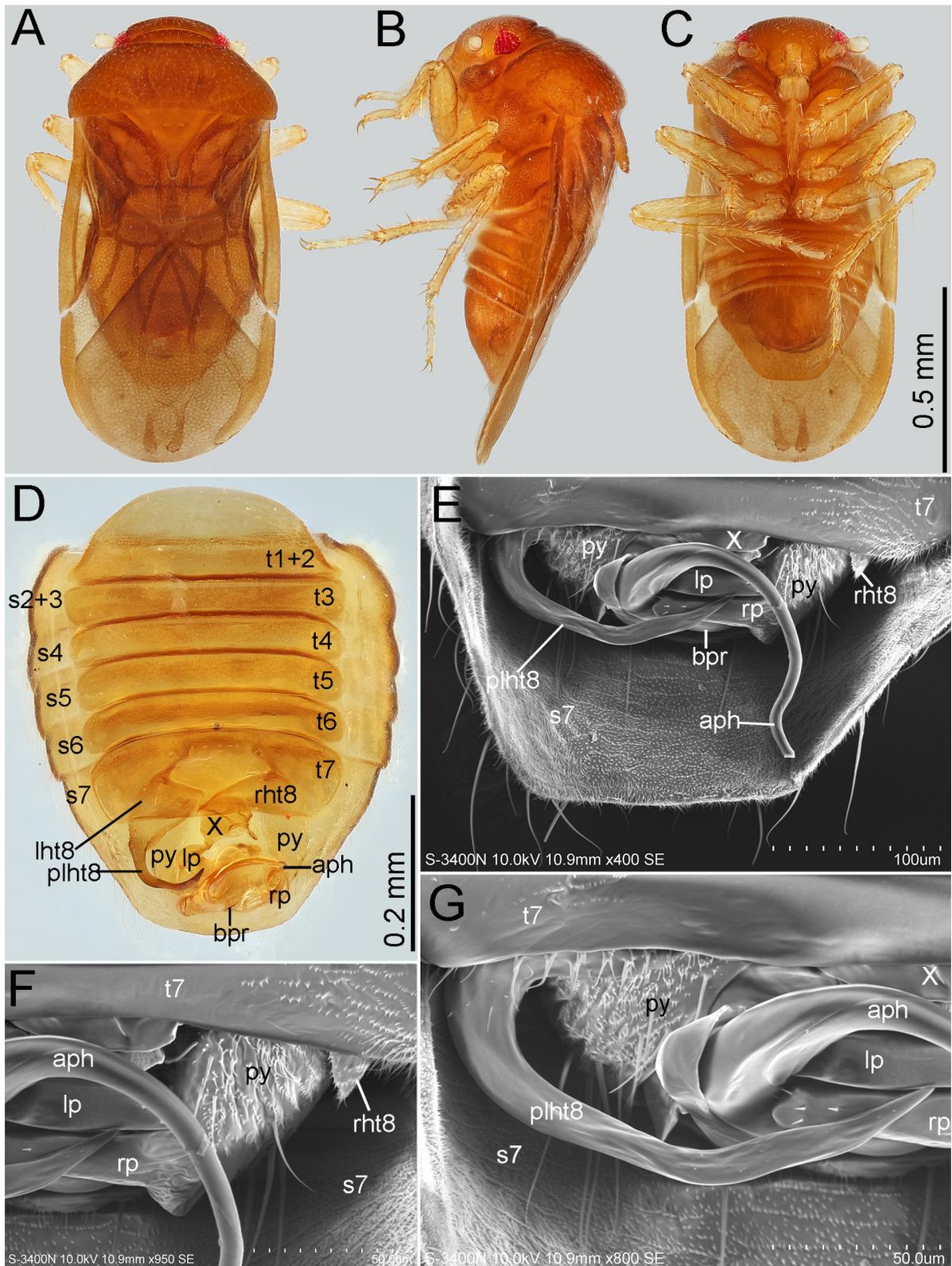
MACROPTEROUS. Small sized (about 1.19–1.25 mm).

COLORATION. Body yellowish brown to light brown, appendages yellowish brown (Fig. 17A–C). Surface, vestiture and general structures as in generic description, except mentioned below.

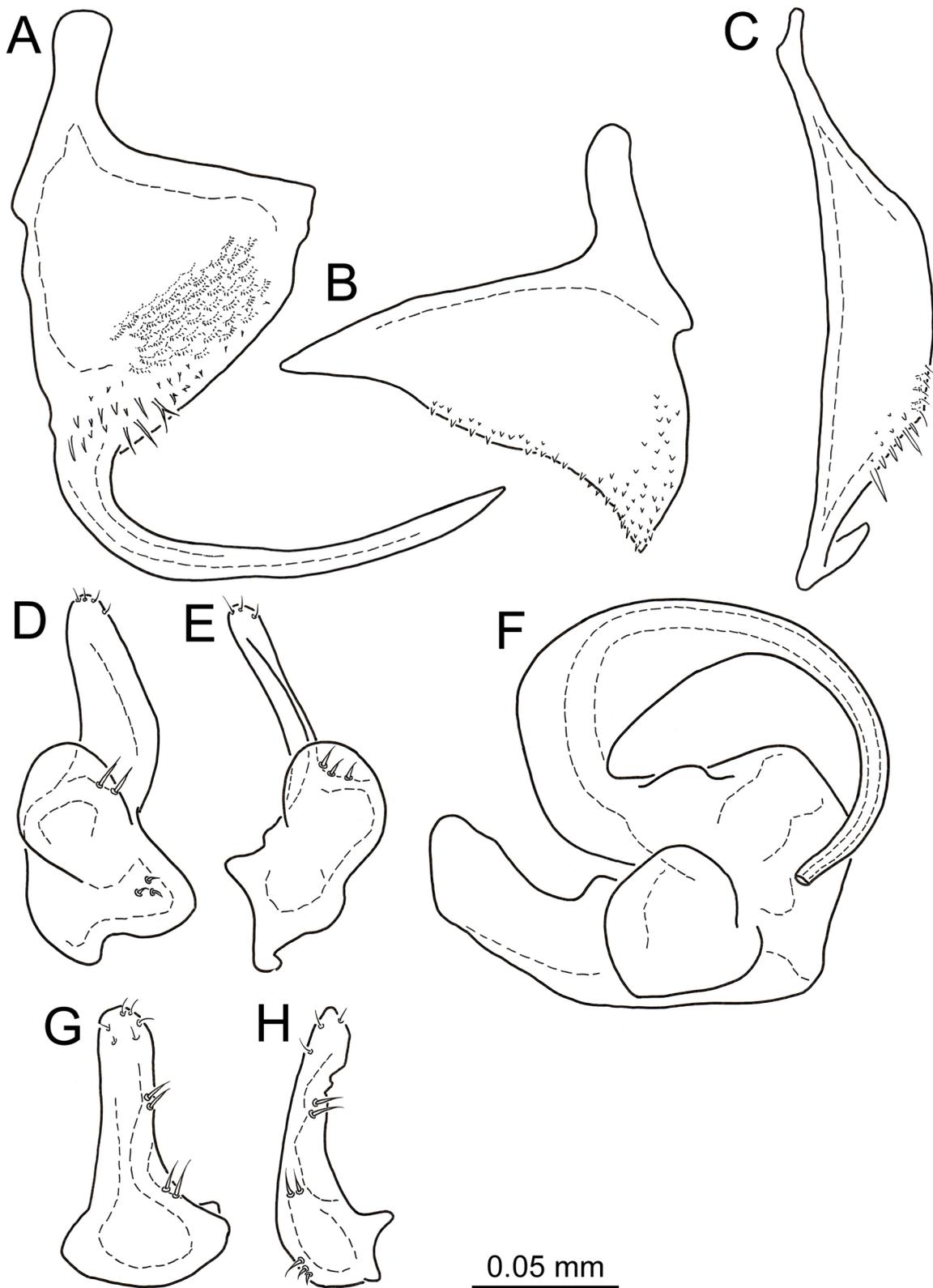
HEAD. Interocular distance 0.75–0.78 × length of maximum width across eyes.

THORAX. Humeral width 1.75–1.84 × as long as middle length of pronotum. Venation of forewing in accordance with general pattern of genus. C+Sc, R+M, R and basal portion of 1An darker than wing surface, other veins slightly darker than wing surface (Fig. 27A).

ABDOMEN. Tergite VII slightly asymmetrical, right portion wider than left portion, sternite VII nearly symmetrical. Tergite VIII subdivided into two hemitergite, left hemitergite with slender, flattened, sword-shaped process horizontally directed mesad, and without thick spiniform microtrichia on its surface (Figs 17D–E, G, 18A). Right hemitergite subtriangular (Fig. 18B).



**Fig. 17.** *Kokeshia redeii* sp. nov. **A–C.** Habitus, holotype, ♂ (SYSBM). **A.** Dorsal view. **B.** Lateral view. **C.** Ventral view. **D.** Pregenital abdomen and genitalia, dorsal view, paratype, ♂ (SYSBM). **E–G.** Scanning electron micrographs of genitalia, paratype, ♂ (SYSBM). **E.** Dorsal view. **F.** Right side, dorsal view. **G.** Left side, dorsal view. Abbreviations: see Material and methods.



**Fig. 18.** *Kokeshia redeii* sp. nov., segment VIII and genitalia, paratype, ♂ (SYSBM). **A, C.** Left hemitergite VIII. **A.** Dorsal view. **C.** Left lateral view. **B.** Right hemitergite VIII, dorsal view. **D–E.** Left paramere, two different aspects. **F.** Phallus. **G–H.** Right paramere, two different aspects.

GENITALIA. Pygophore slightly asymmetrical, dorsal surface with rows of micro teeth, posterior area with about 12 relatively long setae. Parameres strongly asymmetrical, left paramere (Figs 17E, 18D–E) with broadly rounded laminate extension directed dorsal near base, and with flattened and tapering distal projection, and nearly straight; right paramere (Figs 17E, 18G–H) with flattened, round distal projection. Apical portion of phallus (Figs 17D–E, 18F) tubular, short, forming one incomplete coil outside of pygophore.

#### Female

Unknown.

#### Distribution

China: Yunnan (Fig. 32).

#### *Kokeshia renae* sp. nov.

[urn:lsid:zoobank.org:act:2F0A205C-6F3C-4674-A26E-4E440C7993BF](https://zoobank.org/act:2F0A205C-6F3C-4674-A26E-4E440C7993BF)

Figs 19–20, 27B, 30B, 32

#### Diagnosis

*Kokeshia renae* sp. nov. can be recognized from all other species of *Kokeshia* by tergite VIII subdivided into two hemitergites, left hemitergite VIII with a subtriangular process, with numerous semi-erect microtrichia on surface, and the ends of these microtrichia unbranched or split into two to four branches (Figs 19D–E, G, 20A–B). Right hemitergite VIII with a subtriangular posterolateral portion projecting posteriad, which bearing numerous short to relative long microtrichia at its apex (Figs 19D–F, 20B–C).

#### Etymology

The species epithet is derived from and dedicated to Prof. Shuzhi Ren (Institute of Entomology, Nankai University, China), recognizing her contributions to the study of egg morphology of Heteroptera and the study of taxonomy of Chinese Heteroptera.

#### Material examined

##### Holotype

CHINA • ♂; Yunnan Province, Lincang City, Cangyuan County, Banhong Town; 23°18'44.65" N, 99°4'39.48" E; ca 920 m a.s.l.; 6 Aug. 2019; Jiu-Yang Luo leg.; light trap; SYSBM.

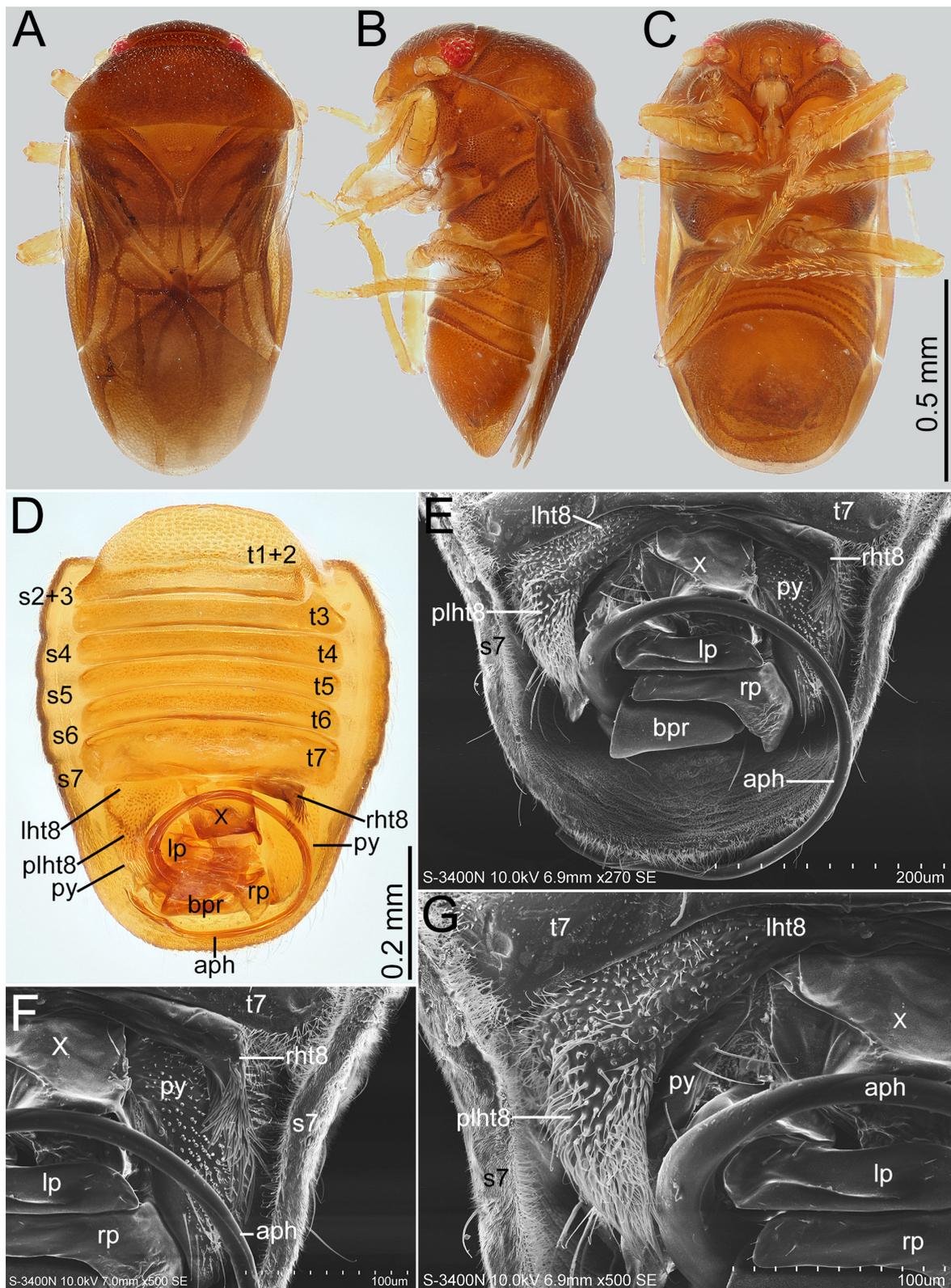
##### Paratypes

CHINA • 2 ♂♂; same collection data as for holotype; SYSBM.

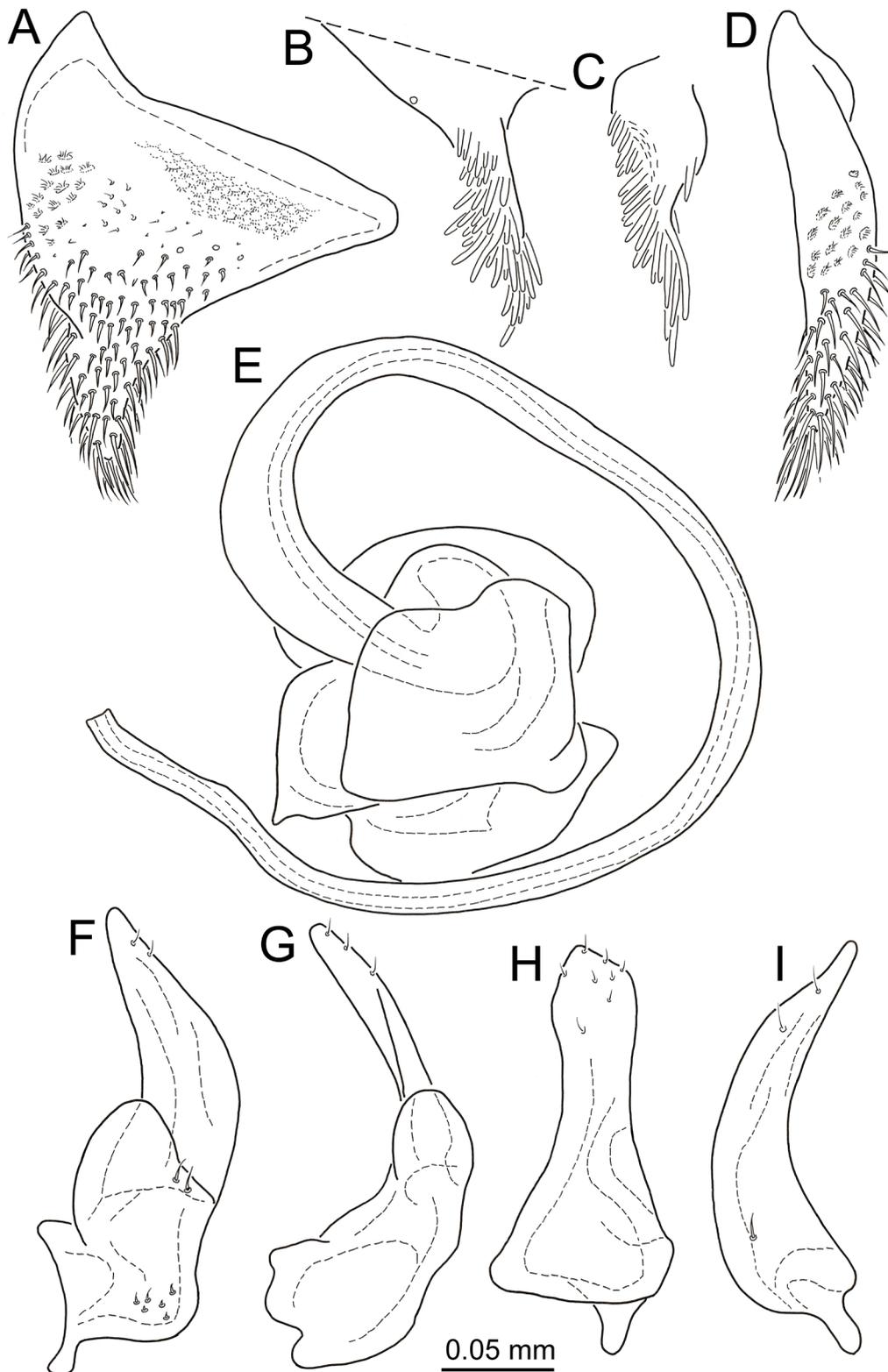
#### Description

##### Male

MEASUREMENTS (in mm) (male holotype / male paratypes, N = 2). Total body length 1.21 / 1.18–1.23; length of head 0.21 / 0.21–0.23, maximum width across eyes 0.38 / 0.38, interocular distance 0.26 / 0.26–0.27; length of antennal segment I 0.07 / 0.07–0.08, segment II 0.07 / 0.07–0.08, segment III 0.26 / 0.28, segment IV 0.32 / 0.29–0.33; length of labial segment I 0.06 / 0.06–0.07, segment II 0.04 / 0.05, segment III 0.04 / 0.05, segment IV 0.10 / 0.11; middle length of pronotum 0.35 / 0.34–0.37, length of collar 0.06 / 0.06, humeral width 0.62 / 0.63–0.64; length of forewing 1.06 / 1.05–1.06; length of fore femur 0.30 / 0.30–0.31, fore tibia 0.32 / 0.32, fore tarsus 0.13 / 0.13; length of middle femur 0.32 / 0.33, middle tibia 0.32 / 0.33–0.34, middle tarsus 0.11 / 0.12; length of hind femur 0.36 / 0.38–0.39, hind tibia 0.53 / 0.52–0.53, hind tarsus 0.16 / 0.17–0.18; greatest width of abdomen 0.53 / 0.51–0.52.



**Fig. 19.** *Kokeshia renae* sp. nov. **A–C.** Habitus, holotype, ♂ (SYSBM). **A.** Dorsal view. **B.** Lateral view. **C.** Ventral view. **D.** Pregenital abdomen and genitalia, dorsal view, paratype, ♂ (SYSBM). **E–G.** Scanning electron micrographs of genitalia, paratype, ♂ (SYSBM). **E.** Dorsal view. **F.** Right side, dorsal view. **G.** Left side, dorsal view. Abbreviations: see Material and methods.



**Fig. 20.** *Kokeshia renae* sp. nov., segment VIII and genitalia, paratype, ♂ (SYSBM). **A, D.** Left hemitergite VIII. **A.** Dorsal view. **D.** Left lateral view. **B–C.** Apex of right hemitergite VIII. **B.** Dorsal view. **C.** Right lateral view. **E.** Phallus. **F–G.** Left paramere, two different aspects. **H–I.** Right paramere, two different aspects.

MACROPTEROUS. Small sized (about 1.18–1.23 mm).

COLORATION. Body light brown to brown, appendages yellowish brown (Fig. 19A–C). Surface, vestiture and general structures as in generic description, except mentioned below.

HEAD. Interocular distance  $0.68\text{--}0.71 \times$  length of maximum width across eyes.

THORAX. Humeral width  $1.73\text{--}1.85 \times$  as long as middle length of pronotum. Venation of forewing in accordance with general pattern of genus. C+Sc, R+M, R and basal portion of 1An darker than wing surface, other veins slightly darker than wing surface (Fig. 27B).

ABDOMEN. Tergite VII and sternite VII slightly asymmetrical. Tergite VIII subdivided into two hemitergites, left hemitergite VIII with subtriangular process, with numerous semi-erect microtrichia on surface, ends of microtrichia unbranched or split into two to four branches (Figs 19D–E, G, 20A–B). Basal portion of the process with sparsely short microtrichia. Right hemitergite VIII with subtriangular posterolateral portion projecting posteriad, bearing numerous relative long microtrichia at apex (Figs 19D–F, 20B–C).

GENITALIA. Pygophore simple, asymmetrical, dorsal surface with relative dense small round projections and short setae, posterior portion of with relatively long setae. Parameres strongly asymmetrical, left paramere (Figs 19E, 20F–G) with broadly rounded laminate extension directed dorsal near base, and with flattened and broad distal projection, and curved inward; right paramere (Figs 19E, 20H–I) with flattened, round distal projection. Apical portion of phallus (Figs 19D–E, 18E) tubular, forming more than one coil outside of pygophore.

#### **Female**

Unknown.

#### **Distribution**

Yunnan Province, China (Fig. 32).

*Kokeshia weirauchae* sp. nov.

[urn:lsid:zoobank.org:act:884C3441-266D-4AB0-BA4C-2E1FE87BB781](https://doi.org/10.3896/PLI.2022.802.1)

Figs 21–22, 27C, 30C, 32

#### **Diagnosis**

The male of *K. weirauchae* sp. nov. is similar to *K. caii* sp. nov., but can be recognized from the latter by tergite VIII subdivided into two hemitergites, left hemitergite VIII with a curved, finger-shaped process, with about six thick spiniform microtrichia at ventral side (Figs 21D–G, 22A, H).

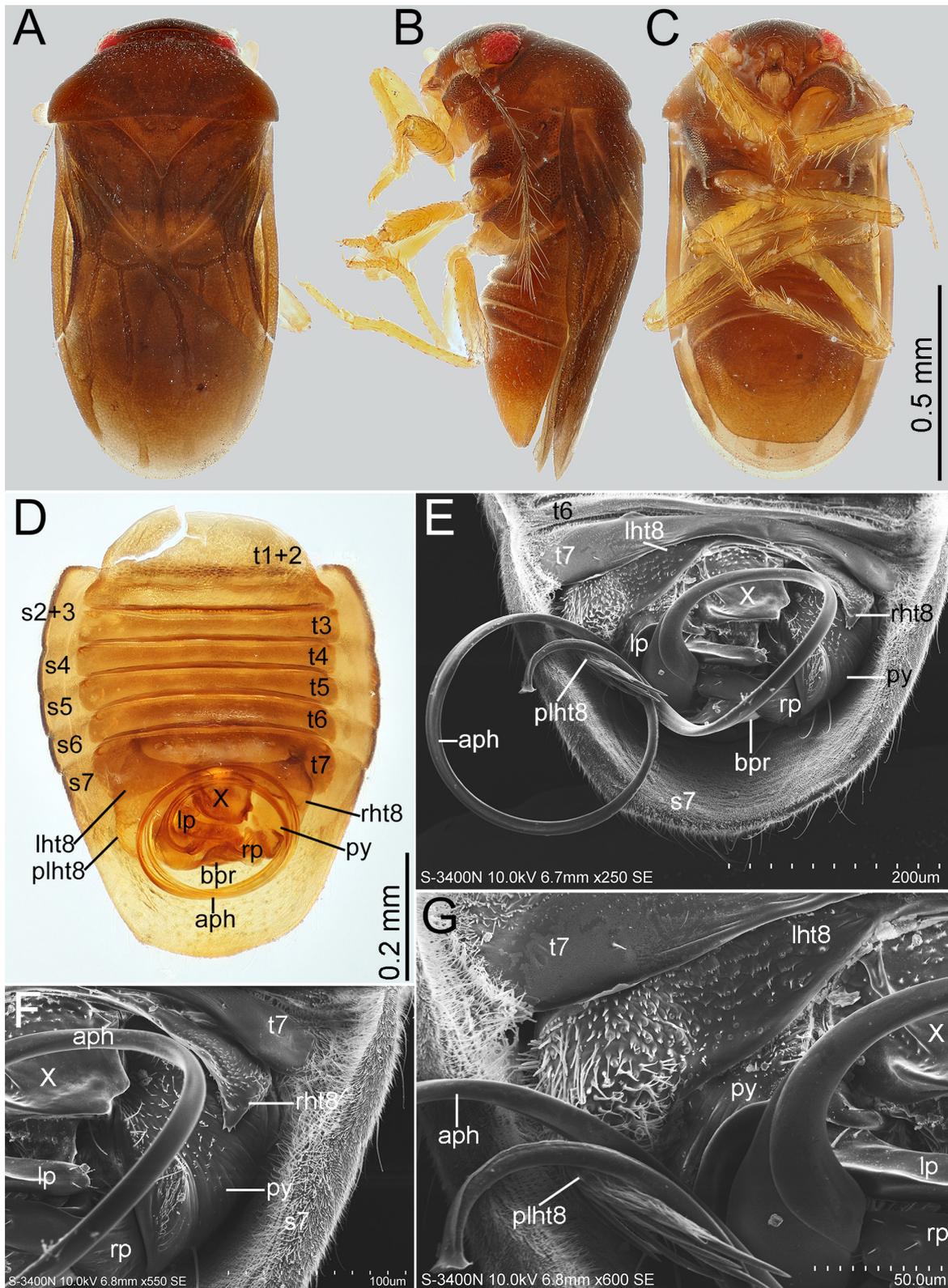
#### **Etymology**

The species epithet is derived from and dedicated to Prof. Christiane Weirauch (Department of Entomology, University of California, Riverside, USA), recognizing her contributions to the study of taxonomy, morphology and phylogeny of Heteroptera and Dipsocoromorpha.

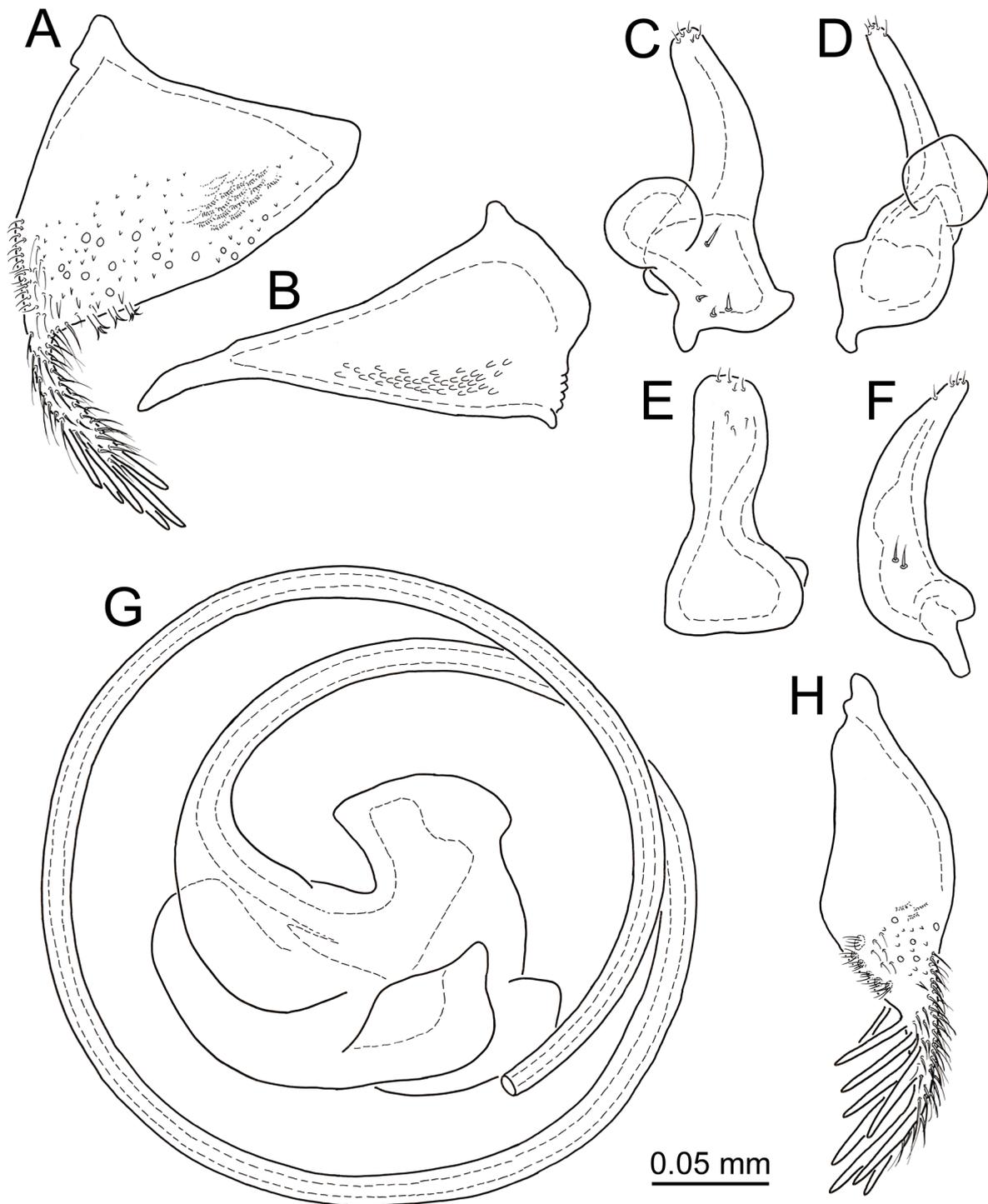
#### **Material examined**

##### **Holotype**

CHINA • ♂; Yunnan Province, Honghe, Jinping County, Adebo Town;  $23^{\circ}18'44.65''$  N,  $99^{\circ}4'39.48''$  E; ca 1480 m a.s.l.; 30 Jul. 2016; Jiu-Yang Luo leg.; NKUM.



**Fig. 21.** *Kokeshia weirauchae* sp. nov. **A–C.** Habitus, holotype, ♂ (NKUM). **A.** Dorsal view. **B.** Lateral view. **C.** Ventral view. **D.** Pregenital abdomen and genitalia, dorsal view, paratype, ♂ (SYSBM). **E–G.** Scanning electron micrographs of genitalia, paratype, ♂ (SYSBM). **E.** Dorsal view. **F.** Right side, dorsal view. **G.** Left side, dorsal view. Abbreviations: see Material and methods.



**Fig. 22.** *Kokeshia weirauchae* sp. nov., segment VIII and genitalia, paratype, ♂ (SYSBM). **A, H.** Left hemitergite VIII. **A.** Dorsal view. **H.** Left lateral view. **B.** Right hemitergite VIII, dorsal view. **C–D.** Left paramere, two different aspects. **E–F.** Right paramere, two different aspects. **G.** Phallus.

### Paratypes

CHINA • 4 ♂♂; same collection data as for holotype; SYSBM.

### Description

#### Male

MEASUREMENTS (in mm) (male holotype / male paratypes, N = 4). Total body length 1.23 / 1.22–1.30; length of head 0.23 / 0.20–0.22, maximum width across eyes 0.39 / 0.39–0.40, interocular distance 0.24 / 0.24–0.25; length of antennal segment I 0.07 / 0.07, segment II 0.08 / 0.07, segment III 0.25 / 0.27, segment IV 0.32 / 0.31–0.33; length of labial segment I 0.07 / 0.06–0.07, segment II 0.05 / 0.05, segment III 0.04 / 0.03–0.05, segment IV 0.10 / 0.09–0.11; middle length of pronotum 0.35 / 0.34–0.36, length of collar 0.06 / 0.05–0.06, humeral width 0.63 / 0.61–0.63; length of forewing 1.09 / 1.00–1.11; length of fore femur 0.29 / 0.29–0.30, fore tibia 0.31 / 0.30–0.32, fore tarsus 0.11 / 0.11–0.13; length of middle femur 0.33 / 0.31–0.34, middle tibia 0.33 / 0.30–0.33, middle tarsus 0.11 / 0.11–0.13; length of hind femur 0.35 / 0.34–0.37, hind tibia 0.52 / 0.50–0.54, hind tarsus 0.17 / 0.16–0.18; greatest width of abdomen 0.49 / 0.52–0.53.

MACROPTEROUS. Small sized (about 1.22–1.30 mm).

COLORATION. Body brown, appendages yellowish brown (Fig. 21A–C). Surface, vestiture and general structures as in generic description, except mentioned below.

HEAD. Interocular distance  $0.60\text{--}0.64 \times$  length of maximum width across eyes.

THORAX. Humeral width  $1.72\text{--}1.85 \times$  as long as middle length of pronotum. Venation of forewing in accordance with general pattern of genus. C+Sc, R+M, R and basal portion of 1An darker than wing surface, other veins slightly darker than wing surface (Fig. 27C).

ABDOMEN. Tergite VII and sternite VII slightly asymmetrical. Tergite VIII subdivided into two hemitergites, left hemitergite VIII with curved, finger-shaped process, with about six thick spiniform microtrichia at its ventral side; besides, numerous semi-erect microtrichia at its surface, and ends of microtrichia unbranched or split into two to four branches. Basal portion of process with sparsely short microtrichia (Fig. 21D–E, G). Right hemitergite VIII with triangular posterolateral portion projecting posteriad (Figs 21F, 22G).

GENITALIA. Pygophore simple, asymmetrical, dorsal surface with small, relative dense round projections and short setae, posterior area with relatively long setae. Parameres strongly asymmetrical, left paramere (Figs 21E, 22C–D) with near round laminate extension directed dorsal near base, and with flattened and broad distal projection, and slightly curved inward; right paramere (Figs 21E, 22E–F) with flattened, blunt distal projection. Apical portion of phallus (Figs 21D–E, 22G) slender and tubular, forming more than two and a half coils outside of pygophore.

#### Female

Unknown.

### Distribution

Yunnan Province, China (Fig. 32).

***Kokeshia xiei*** Rédei, Ren & Bu, 2012  
Figs 23–24, 27D, 30D, 32

*Kokeshia xiei* Rédei, Ren & Bu, 2012: 30 (original description).

**Diagnosis**

*Kokeshia xiei* can be recognized from all other species of *Kokeshia* by tergite VIII subdivided into two hemitergites, left hemitergite VIII with a long, thick and horizontally directed process, with numerous thick spiniform microtrichia at its ventral surface (Figs 23D–E, G, 24A–B).

**Material examined**

**Holotype**

CHINA • ♂; Hainan Province, Lingshui County, Diaoluoshan; ca 300 m a.s.l.; 10 Aug. 2008; Qiang Xie leg.; at light; NKUM.

**Paratypes**

CHINA • 12 ♂♂; same collection data as for holotype; NKUM.

**Non-type specimens**

CHINA • 67 ♂♂; Hainan Province, Baisha County, Yinggeling National Nature Reserve, Nankai Protection Station; 19°4'45" N, 109°24'40" E; ca 260 m a.s.l.; 20 Jul. 2013; Yan-Hui Wang leg.; at light; NKUM.

**Distribution**

Yunnan Province, China (Fig. 32).

***Kokeshia zhengi*** Rédei, Ren & Bu, 2012  
Figs 25, 31–32

*Kokeshia zhengi* Rédei, Ren & Bu, 2012: 32 (original description).

**Diagnosis**

*Kokeshia zhengi* can be recognized from all other species of *Kokeshia* by tergite VIII subdivided into two hemitergites, left hemitergite VIII with a broad, thick near triangular process, with about 8 thick spiniform microtrichia at its right posterolateral margin (Figs 25C, 31).

**Material examined**

**Holotype**

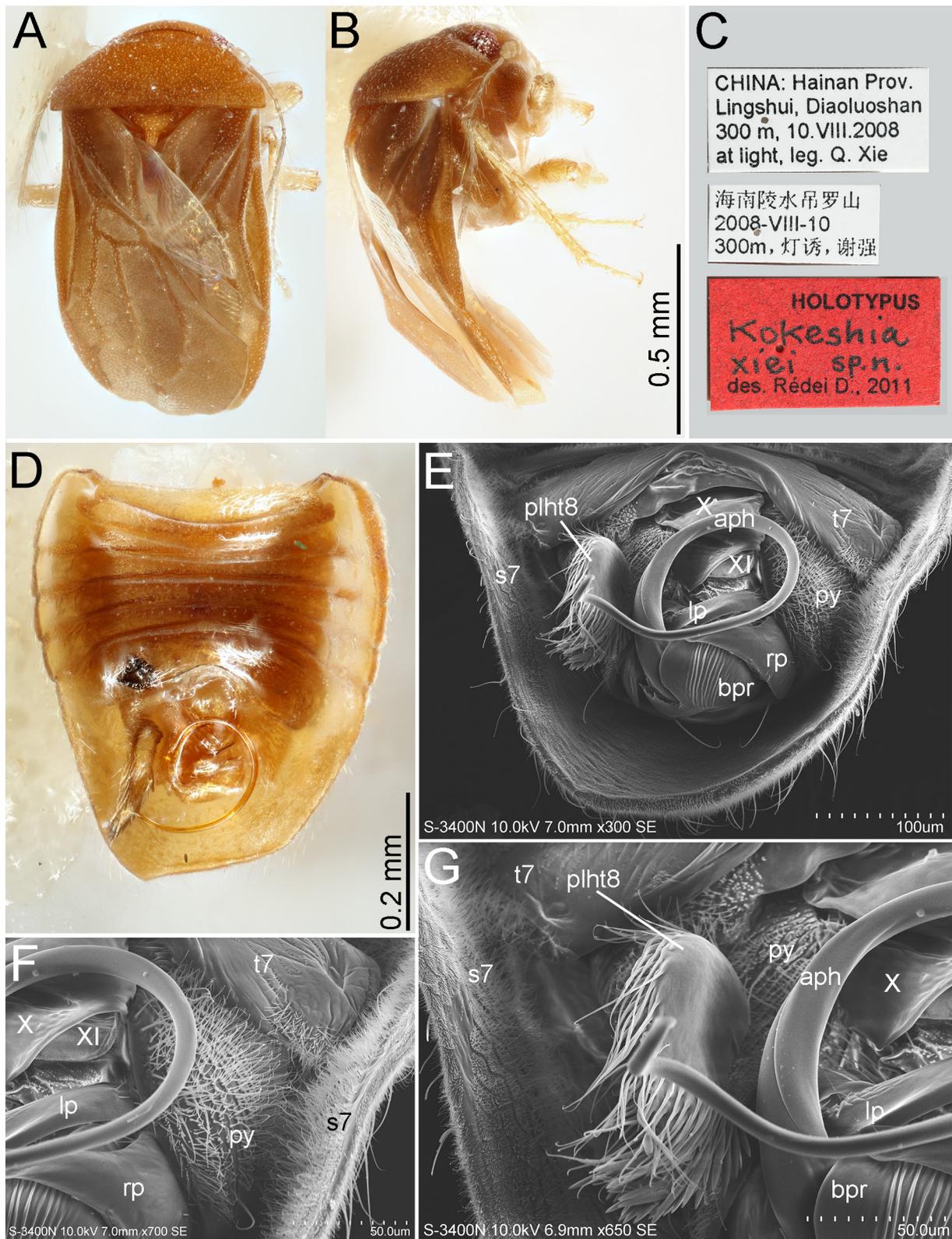
CHINA • ♂; Hubei Province, Fang County, Tucheng Town; 16–23 Jul. 2011; Xi-Ping Zhang, Chuan-Ren Li, Jing Zhong and Chang-Liang Hou leg.; tobacco field; NKUM.

**Paratypes**

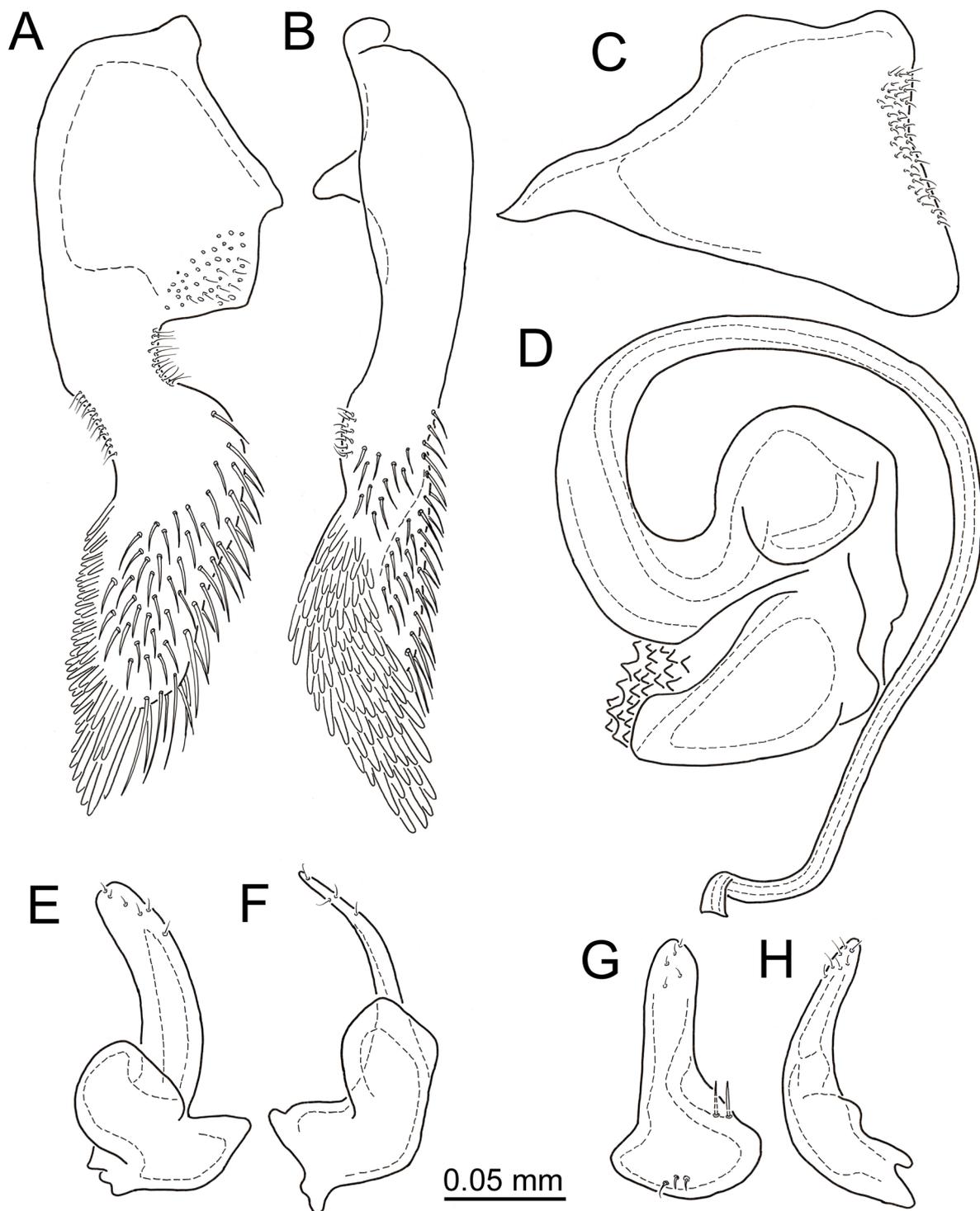
CHINA • 2 ♂♂; same collection data as for holotype; NKUM.

**Distribution**

Yunnan Province, China (Fig. 32).



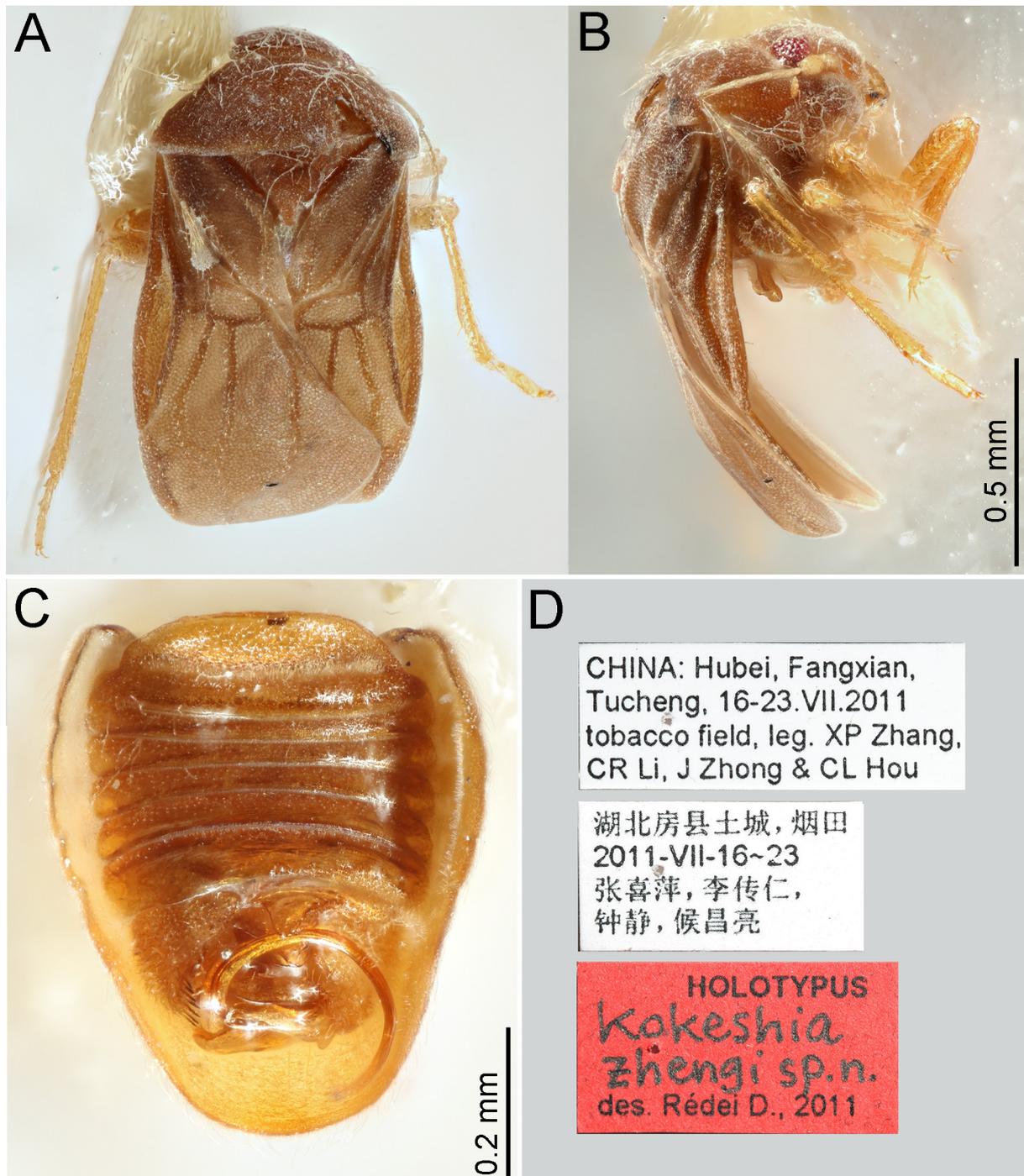
**Fig. 23.** *Kokeshia xiei* Rédei, Ren & Bu, 2012. **A–D.** Holotype, ♂ (NKUM). **A.** Dorsal view. **B.** Lateral view. **C.** Labels. **D.** Pregenital abdomen and genitalia, dorsal view. **E–G.** Scanning electron micrographs of genitalia, ♂ (SYSBM). **E.** Dorsal view. **F.** Right side, dorsal view. **G.** Left side, dorsal view. Abbreviations: see Material and methods.



**Fig. 24.** *Kokeshia xiei* Rédei, Ren & Bu, 2012, segment VIII and genitalia, ♂ (SYSBM). **A–B.** Left hemitergite VIII. **A.** Dorsal view. **B.** Left lateral view. **C.** Right hemitergite VIII, dorsal view. **D.** Phallus. **E–F.** Left paramere, two different aspects. **G–H.** Right paramere, two different aspects.

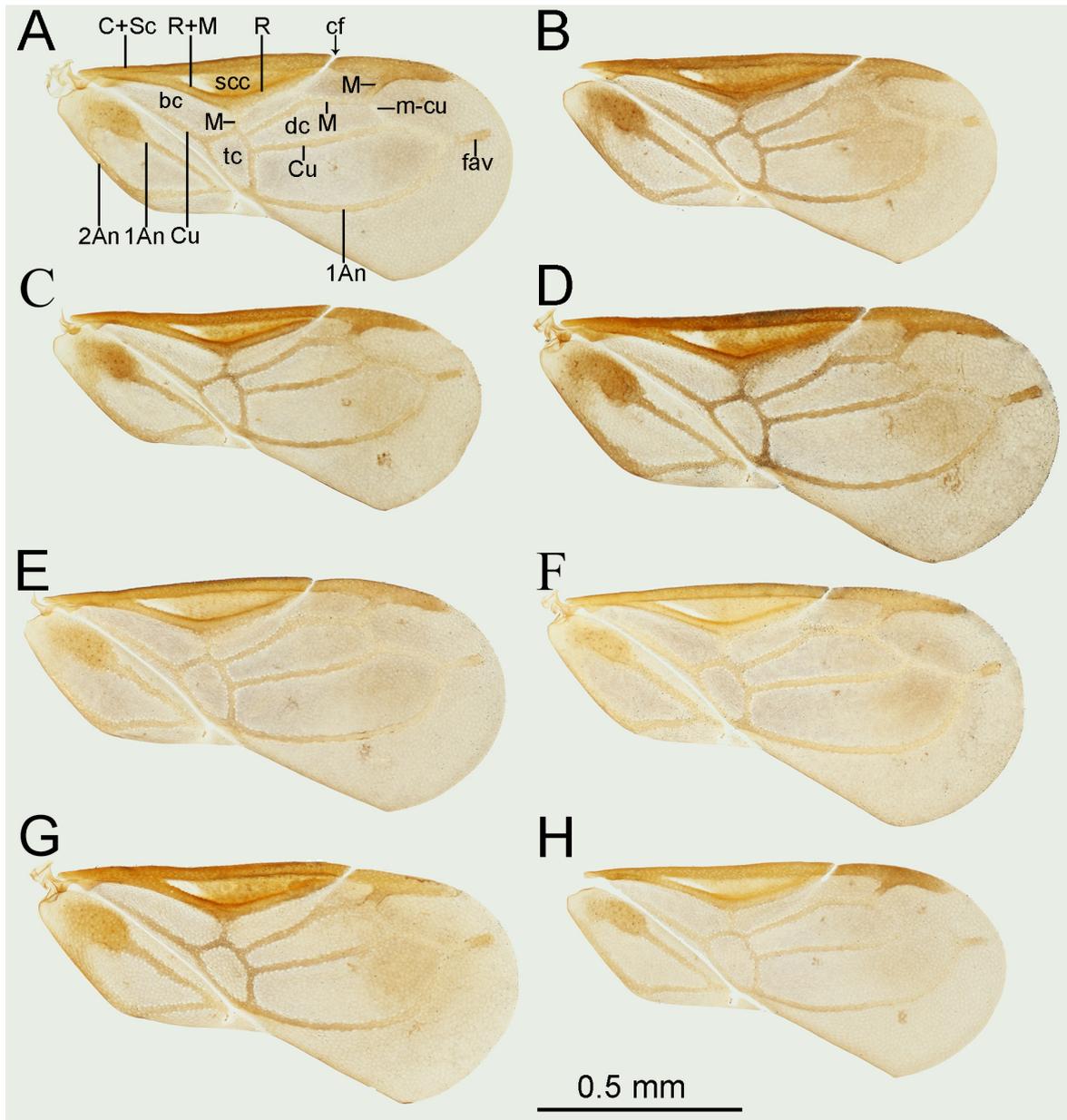
**Key to the species of *Kokeshia* Miyamoto, 1960**

1. Tergite VIII not subdivided into two hemitergites, only a long, flattened, acuminate process on the right portion of tergite VIII, bent at about  $\frac{1}{3}$  from its apex (Fig. 28A) (China) ..... *K. acutiformis* sp. nov.
- Tergite VIII subdivided into left and right hemitergites ..... 2



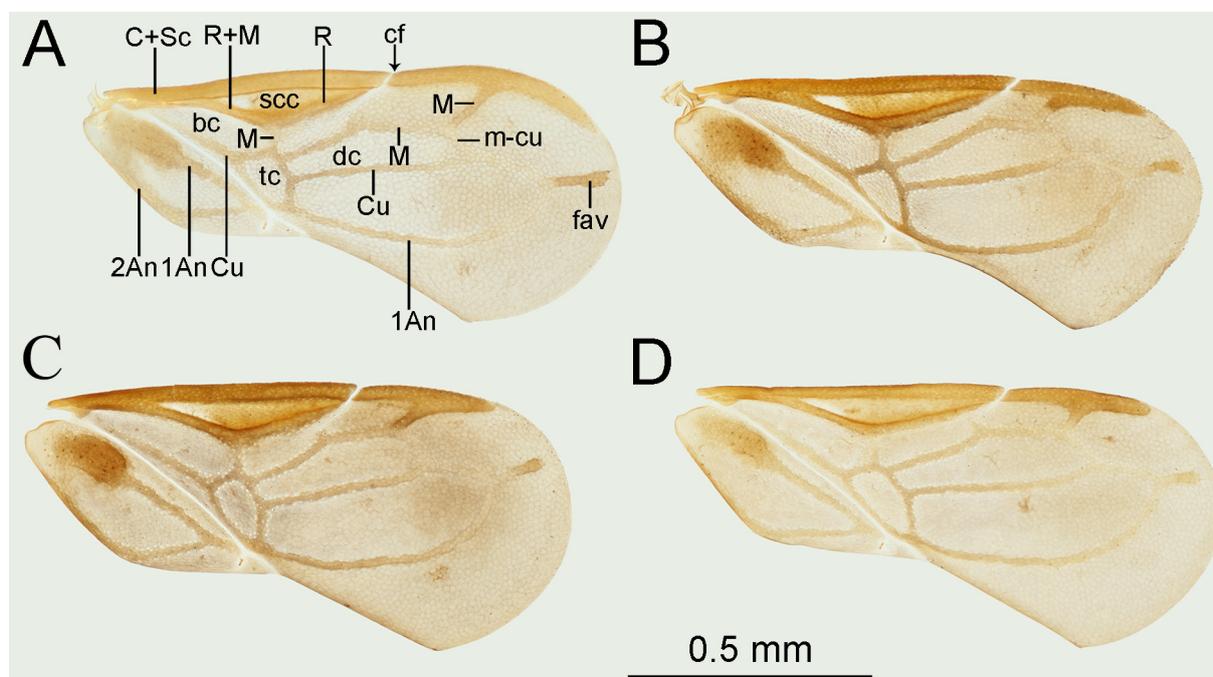
**Fig. 25.** *Kokeshia zhengi* Rédei, Ren & Bu, 2012. **A–D.** Holotype, ♂ (NKUM). **A.** Dorsal view. **B.** Lateral view. **C.** Pregenital abdomen and genitalia, dorsal view. **D.** Labels.

2. Process of left hemitergite VIII elongated, needle-shaped, flagelliform or filiform ..... 3
  - Process of left hemitergite VIII not needle-shaped, flagelliform or filiform ..... 6
3. Process of left hemitergite VIII significantly long, almost reaching the width of tergite VII, the process with an appendage split into three to five branches (Fig. 17D; Ren & Zheng 1992: 191, figs 21–23) (China) ..... *K. hsiaoi* Ren & Zheng, 1992
  - Process of left hemitergite VIII relatively long, more than half the width of tergite VII, the process without any appendage ..... 4



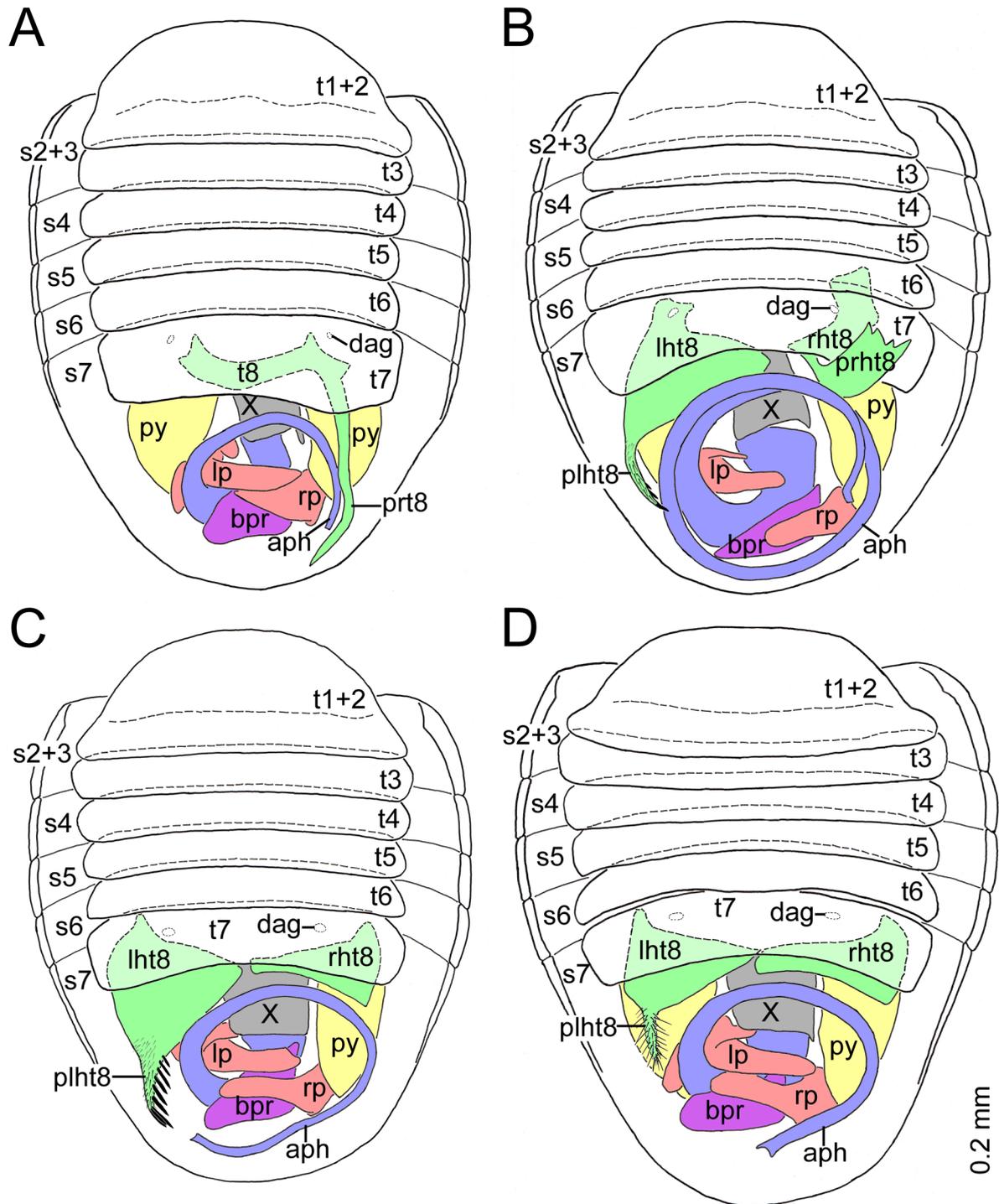
**Fig. 26.** Forewings of *Kokeshia* spp., dorsal views. **A.** *K. acutiformis* sp. nov., paratype, ♂ (SYSBM). **B.** *K. bairi* sp. nov., paratype, ♂ (SYSBM). **C.** *K. bui* sp. nov., paratype, ♂ (SYSBM). **D.** *K. caii* sp. nov., paratype, ♂ (SYSBM). **E.** *K. drepanoides* sp. nov., paratype, ♂ (SYSBM). **F.** *K. hilli* sp. nov., paratype, ♂ (SYSBM). **G.** *K. hsiaoi* Ren & Zheng, 1992, ♂ (SYSBM). **H.** *K. pengae* sp. nov., paratype, ♂ (SYSBM).

4. Process of left hemitergite VIII filiform, rectangularly bent, with spiniform microtrichia on its apex (Štys 1985: 200, figs 37–38, 40) (Nepal) ..... *K. similis* Štys, 1985
  - Process of left hemitergite VIII needle-shaped or flagelliform, not filiform, without spiniform microtrichia on its apex ..... 5
5. Process of left hemitergite VIII slender, flagelliform, curved from approximal middle portion (Rédei 2008: 244, fig. 6; 248, fig. 14) (Thailand) ..... *K. oroszi* Rédei, 2008
  - Process of left hemitergite VIII slender, needle-shaped, curved from base (Fig. 29D) (China) ..... *K. pengae* sp. nov.
6. Process of left hemitergite VIII with a broad brush-like structure formed by hair-like setae ..... 7
  - Process of left hemitergite VIII without broad brush-like structures formed by hair-like setae ..... 8
7. Brush-like structure on left hemitergite VIII formed by several narrow, hair-like setae; apical portion of phallus forming about one incomplete coil outside of pygophore (Štys 1985: 192, figs 15, 17; 194, figs 19–20; 196, fig. 26) (Nepal) ..... *K. martensi* Štys, 1985
  - Brush-like structure on left hemitergite VIII formed by less numerous and distinctly thicker setae; apical portion of phallus forming more than a half coil outside of pygophore (Rédei 2008: 244, fig. 5; 246, fig. 7) (India ..... *K. stysi* Rédei, 2008
8. Process of left hemitergite VIII triangular or finger-shaped ..... 9
  - Process of left hemitergite VIII not triangular or finger-shaped ..... 14
9. Process of left hemitergite VIII triangular or subtriangular ..... 10
  - Process of left hemitergite VIII finger-shaped ..... 12

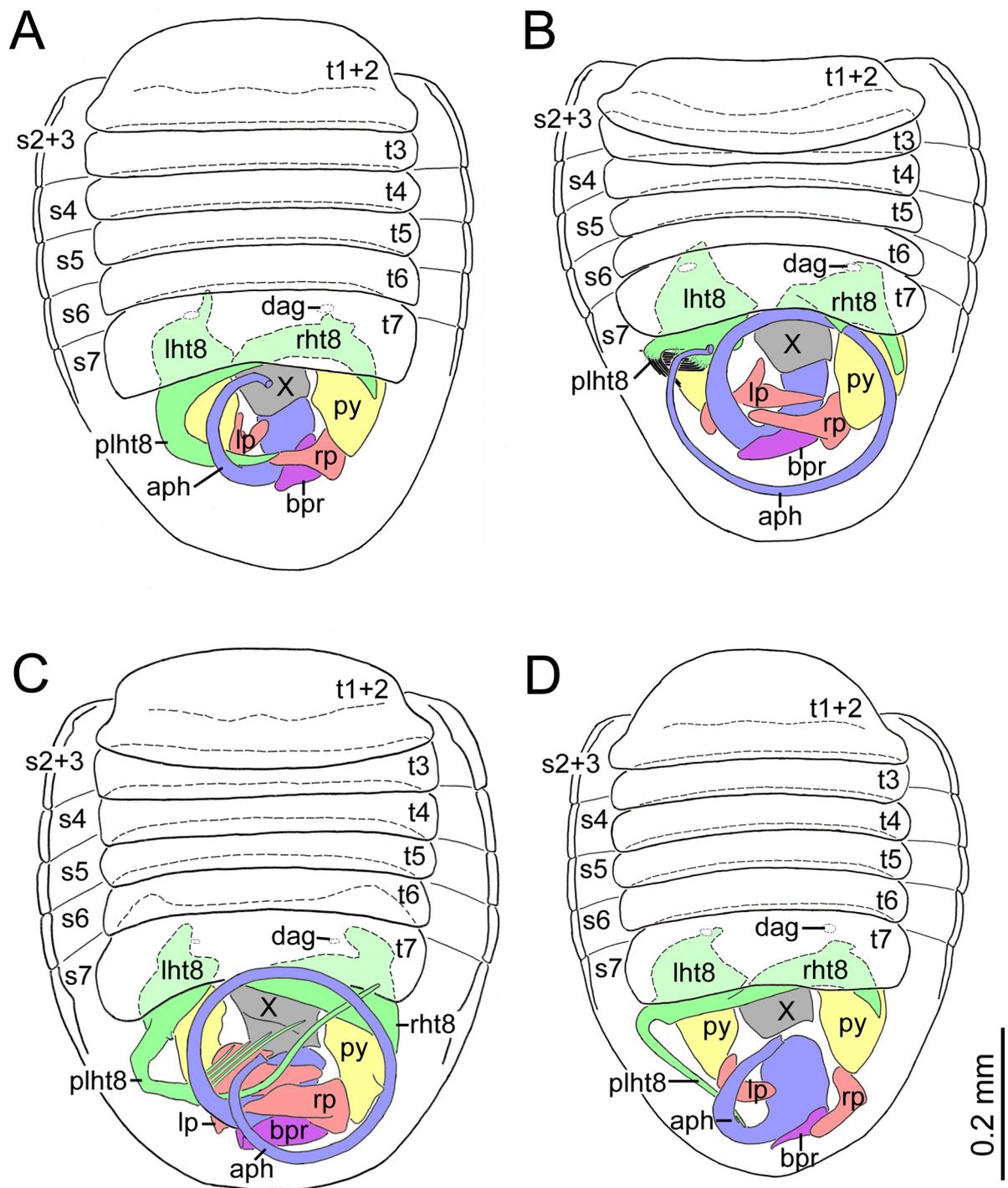


**Fig. 27.** Forewings of *Kokeshia* spp., dorsal view. **A.** *K. redeii* sp. nov., paratype, ♂ (SYSBM). **B.** *K. renae* sp. nov., paratype, ♂ (SYSBM). **C.** *K. weirauchae* sp. nov., paratype, ♂ (SYSBM). **D.** *K. xiei* Rédei, Ren & Bu, 2012. ♂ (SYSBM).

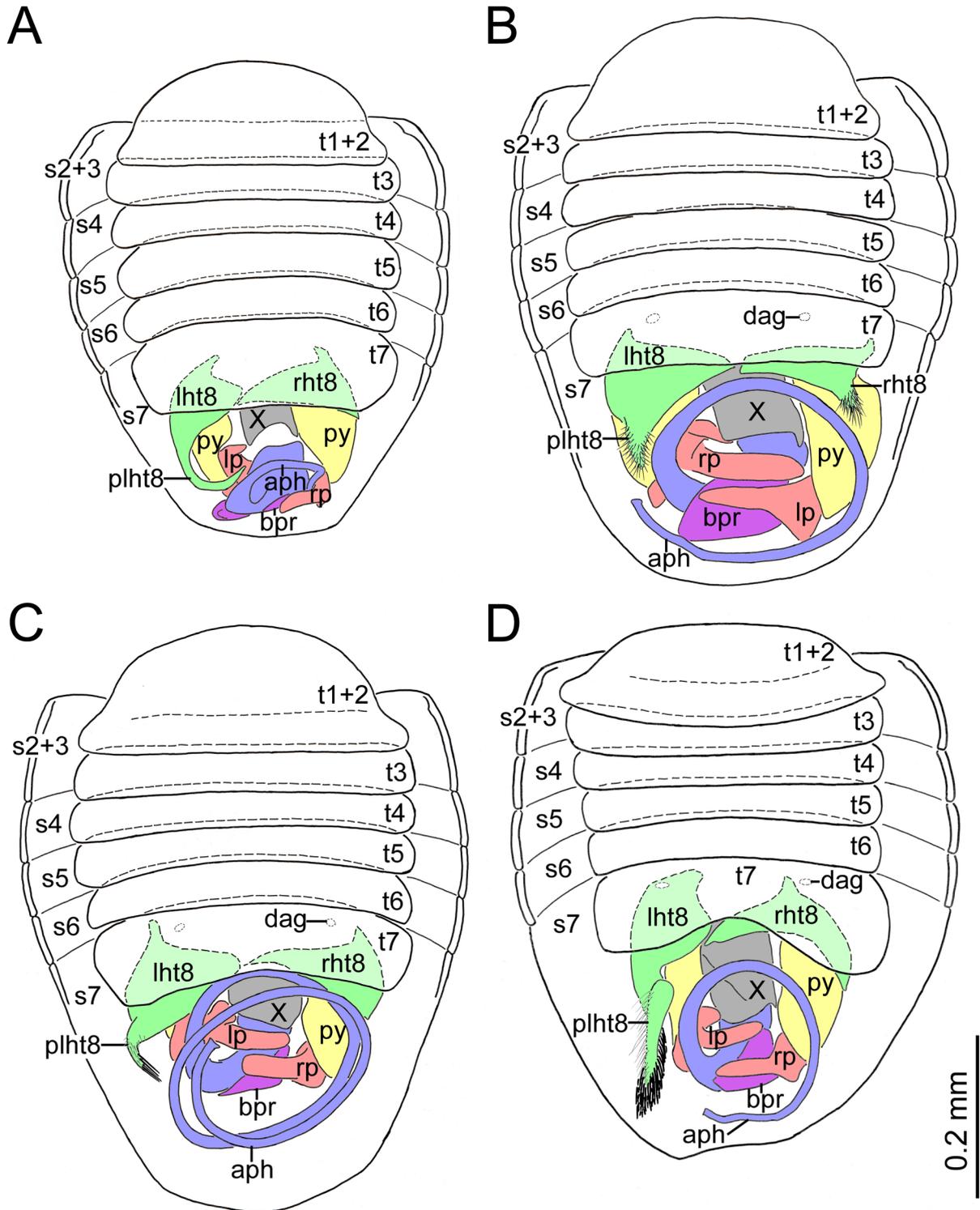
10. Process of left hemitergite VIII with a broad, thick near triangular process, with about 8 thick spiniform microtrichia at its right posterolateral margin (Rédei et al. 2012: 30, fig. 2; 31, fig. 4; 33, figs 8–10) (China) ..... ***K. zhengi*** Rédei, Ren & Bu, 2012  
 – Process of left hemitergite VIII near triangular, not broad ..... 11
11. Process of left hemitergite VIII elongated triangular, right margin with about nine, thick, nearly parallel spiniform microtrichia (Fig. 28C) (China) ..... ***K. bui*** sp. nov.  
 – Process of left hemitergite VIII subtriangular, without thick spiniform microtrichia (Fig. 30B) (China) ..... ***K. renae*** sp. nov.
12. Process of left hemitergite VIII elongate, curved, finger-shaped, with one in apex, and two more thick spiniform microtrichia in ventral side of distal portion, right hemitergite VIII with lamellate process above tergite VII (Fig. 28B) (China) ..... ***K. baii*** sp. nov.  
 – Process of left hemitergite VIII moderate long, finger-shaped, right hemitergite VIII without lamellate process above tergite VII ..... 13
13. Process of left hemitergite VIII curved, finger-shaped, with about six thick spiniform microtrichia at ventral side of apex; apical portion of phallus forming about two and a half coils outside of pygophore (Fig. 30C) (China) ..... ***K. weirauchae*** sp. nov.  
 – Process of left hemitergite VIII not curved, finger-shaped, with out thick spiniform setae; apical portion of phallus forming incomplete one coil outside of pygophore (Fig. 28D) (China) .... ***K. caii*** sp. nov.
14. Process of left hemitergite VIII long, thick and horizontally directed, with numerous thick spiniform microtrichia at its ventral surface; apical portion of phallus forming about one coil outside of pygophore (Fig. 30D; Rédei et al. 2012: 30, fig. 1; 31, fig. 3; 33, figs 5–7) (China) ..... ***K. xiei*** Rédei, Ren & Bu, 2012  
 – Process of left hemitergite VIII not as above ..... 15
15. Process of left hemitergite VIII short and thick, hook-shaped, rectangularly bent; apical portion of phallus forming about one and a half coils outside of pygophore (Miyamoto 1960: 171, pl. 19h–i) (Japan) ..... ***K. esakii*** Miyamoto, 1960  
 – Process of left hemitergite VIII not as above ..... 16
16. Process of left hemitergite VIII flattened, broad and curved, sickle-shaped; apical portion of phallus forming about a half coil outside of pygophore (Fig. 29A) (China) ..... ***K. drepanoides*** sp. nov.  
 – Process of left hemitergite VIII not as above ..... 17
17. Process of left hemitergite VIII flattened, slender and curved, sword-shaped; apical portion of phallus forming about one coil outside of pygophore (Fig. 30A) (China) ..... ***K. redeii*** sp. nov.  
 – Process of left hemitergite VIII not as above ..... 18
18. Process of left hemitergite VIII nearly quadrangular, left portion with a raised projection, which bearing about seven thick basal-curved spiniform microtrichia, posterior margin of the process with about seven thick basal-curved spiniform microtrichia; apical portion of phallus forming more than one coil outside of pygophore (Fig. 29B) (China) ..... ***K. hilli*** sp. nov.



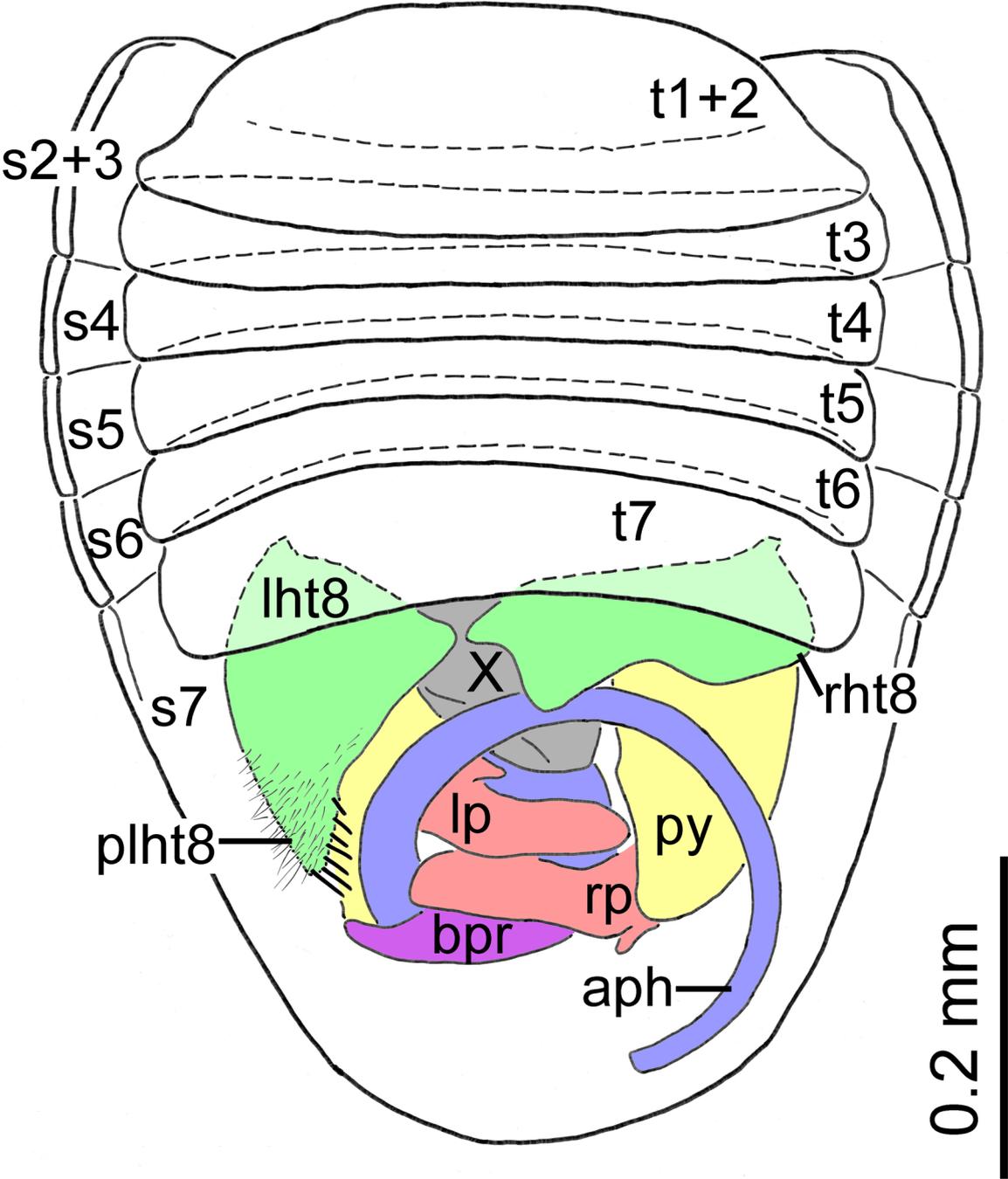
**Fig. 28.** Pregenital abdomen and genitalia of *Kokeshia* spp., dorsal views. **A.** *K. acutiformis* sp. nov., paratype, ♂ (SYSBM). **B.** *K. baii* sp. nov., paratype, ♂ (SYSBM). **C.** *K. bui* sp. nov., paratype, ♂ (SYSBM). **D.** *K. caii* sp. nov., paratype, ♂ (SYSBM). Abbreviations: see Material and methods.



**Fig. 29.** Pregenital abdomen and genitalia of *Kokeshia* spp., dorsal views. **A.** *K. drepanoides* sp. nov., paratype, ♂ (SYSBM). **B.** *K. hilli* sp. nov., paratype, ♂ (SYSBM). **C.** *K. hsiao* Ren & Zheng, 1992, ♂ (SYSBM). **D.** *K. pengae* sp. nov., paratype, ♂ (SYSBM). Abbreviations: see Material and methods.



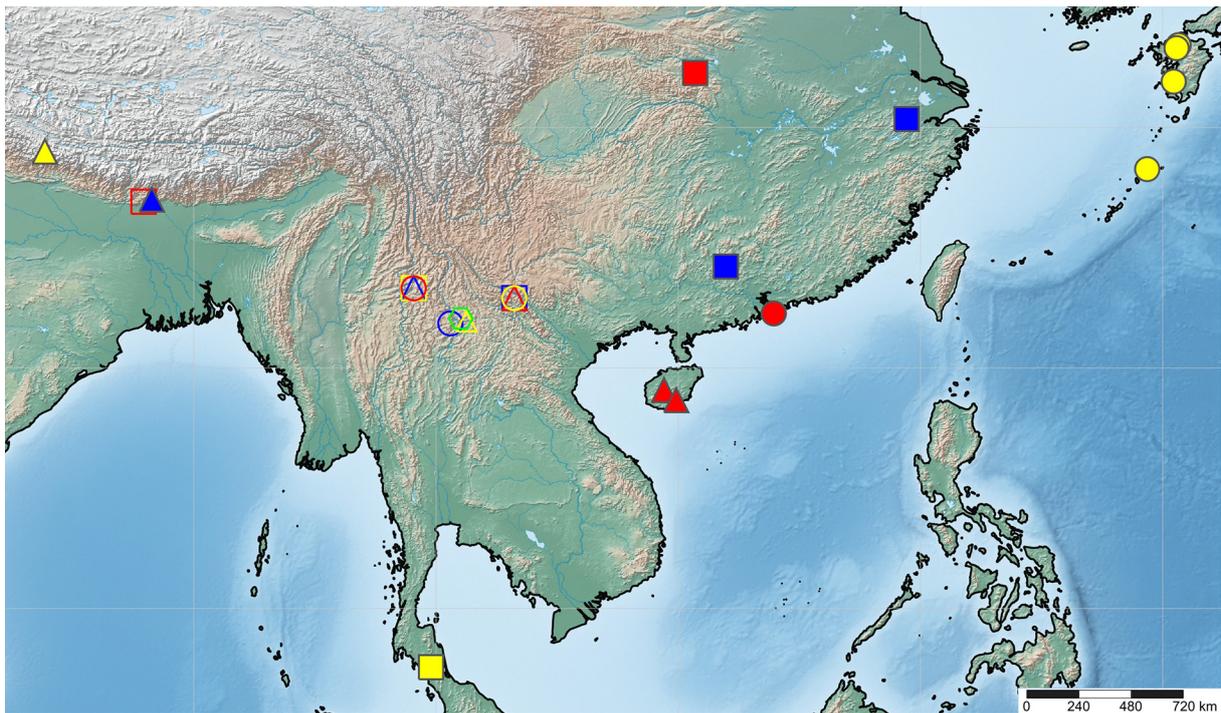
**Fig. 30.** Pregenital abdomen and genitalia of *Kokeshia* spp., dorsal views. **A.** *K. redeii* sp. nov., paratype, ♂ (SYSBM). **B.** *K. renae* sp. nov., paratype, ♂ (SYSBM). **C.** *K. weirauchae* sp. nov., paratype, ♂ (SYSBM). **D.** *K. xiei* Rédei, Ren & Bu, 2012, ♂ (SYSBM). Abbreviations: see Material and methods.



**Fig. 31.** Pregenital abdomen and genitalia of *Kokeshia zhengi* Rédei, Ren & Bu, 2012, holotype, ♂ (NKUM), dorsal view. Abbreviations: see Material and methods.

**Checklist of the genus *Kokeshia* Miyamoto, 1960**

1. *K. acutiformis* Luo & Xie sp. nov.  
Holotype: ♂ (SYSBM); type locality: China (Yunnan: Lincang).  
Distribution. China: Yunnan.
2. *K. baii* Luo & Xie sp. nov.  
Holotype: ♂ (SYSBM); type locality: China (Hong Kong: Lantau Island).  
Distribution. China: Hong Kong.
3. *K. bui* Luo & Xie sp. nov.  
Holotype: ♂ (SYSBM); type locality: China (Yunnan: Lincang).  
Distribution. China: Yunnan.
4. *K. caii* Luo & Xie sp. nov.  
Holotype: ♂ (SYSBM); type locality: China (Yunnan: Xishuangbanna).  
Distribution. China: Yunnan.
5. *K. drepanoides* Luo & Xie sp. nov.  
Holotype: ♂ (NKUM); type locality: China (Yunnan: Honghe).  
Distribution. China: Yunnan.



**Fig. 32.** Distribution map of *Kokeshia* spp. Red open circle = *K. acutiformis* sp. nov.; red solid circle = *K. baii* sp. nov.; blue open triangle = *K. bui* sp. nov.; blue open circle = *K. caii* sp. nov.; yellow open circle = *K. drepanoides* sp. nov.; yellow solid circles = *K. esakii* Miyamoto, 1960; red open triangle = *K. hilli* sp. nov.; blue solid squares = *K. hsiao* Ren & Zheng, 1992; red open square = *K. martensi* Štys, 1985; yellow solid square = *K. oroszi* Rédei, 2008; yellow open triangle = *K. pengae* sp. nov.; green open hexagon = *K. redeii* sp. nov.; yellow open square = *K. renae* sp. nov.; yellow solid triangle = *K. similis* Štys, 1985; blue solid triangle = *K. stysi* Rédei, 2008; blue open square = *K. weirauchae* sp. nov.; red solid triangles = *K. xiei* Rédei, Ren & Bu, 2012; red solid square = *K. zhengi* Rédei, Ren & Bu, 2012.

6. *K. esakii* Miyamoto, 1960  
*Kokeshia esakii* Miyamoto, 1960: 163. Holotype: ♂ (ELKU); type locality: Japan (Kyushu: Chikugo).  
Distribution. Japan.
7. *K. hilli* Luo & Xie sp. nov.  
Holotype: ♂ (NKUM); type locality: China (Yunnan: Honghe).  
Distribution. China: Yunnan.
8. *K. hsiaoi* Ren & Zheng, 1992  
*Kokeshia hsiaoi* Ren & Zheng, 1992: 191. Holotype: ♂ [MSIE (LOST)]; type locality: China (Zhejiang: Tianmu Mountain).  
Distribution: China: Guangdong, Zhejiang.  
Notes: the first author visited MSIE and NKUM, didn't find the type series of *K. hsiaoi*.
9. *K. martensi* Štys, 1985  
*Kokeshia martensi* Štys, 1985: 188. Holotype: ♂ (SMFD); type locality: Nepal (Ilam District, Gitang Khola).  
Distribution: Nepal.
10. *K. oroszi* Rédei, 2008  
*Kokeshia oroszi* Štys, 2008: 247. Holotype: ♂ (HNHM); type locality: Thailand (Trang Province, Khao Chong Botanical Garden).  
Distribution: Thailand.
11. *K. pengae* Luo & Xie sp. nov.  
Holotype: ♂ (SYSBM); type locality: China (Yunnan: Xishuangbanna)  
Distribution. China: Yunnan.
12. *K. redeii* Luo & Xie sp. nov.  
Holotype: ♂ (SYSBM); type locality: China (Yunnan: Xishuangbanna).  
Distribution. China: Yunnan.
13. *K. renae* Luo & Xie sp. nov.  
Holotype: ♂ (SYSBM); type locality: China (Yunnan: Lincang).  
Distribution. China: Yunnan.
14. *K. similis* Štys, 1985  
*Kokeshia similis* Štys, 1985: 199. Holotype: ♂ (SMFD); type locality: Nepal ('Mustang District, S Lethe').  
Distribution: Nepal
15. *K. stysi* Rédei, 2008  
*Kokeshia stysi* Štys, 2008: 242. Holotype: ♂ (HNHM); type locality: India (West Bengal: Darjeeling District).  
Distribution: India.
16. *K. weirauchae* Luo & Xie sp. nov.  
Holotype: ♂ (NKUM); type locality: China (Yunnan: Honghe).  
Distribution. China: Yunnan.

17. *K. xiei* Rédei, Ren & Bu, 2012

*Kokeshia xiei* Rédei, Ren & Bu, 2012: 30. Holotype: ♂ (NKUM); type locality: China (Hainan: Lingshui).

Distribution. China: Hainan.

18. *K. zhengi* Rédei, Ren & Bu, 2012

*Kokeshia zhengi* Rédei, Ren & Bu, 2012: 32. Holotype: ♂ (NKUM); type locality: China (Hubei: Fang County).

Distribution. China: Hubei.

## Discussion

In the present study, we carried out a taxonomic review of all thirteen species of *Kokeshia* occurring in China, including ten newly described ones. We summarized the distribution of all eighteen known species in this genus in Fig. 32. Up to now, the westernmost distribution is in the Mustang District of Nepal, the southern foot of the Himalayas; the easternmost distribution is in Kyushu in Japan; the northernmost distribution is in Hubei in China, near the southern foot of the Qinling Mountains; and the southernmost distribution is in Trang in Thailand. Therefore, the genus as a whole presents a distribution pattern in the Oriental Region. Among all the species of this genus, *K. hsiao* and *K. esakii* have relatively large distribution ranges, from Zhejiang Province to Guangdong Province, China, and from Kyushu Island to Ryukyu Islands, Japan, respectively, while the other species are narrowly distributed. There may be two reasons for this phenomenon. Firstly, the areas where *K. hsiao* and *K. esakii* are distributed lack large geographic barriers; for the latter, despite the strait separation, island chains may contribute to the spread of species. Secondly, the actual distribution range of most species is still unclear, most species are known only from the type locality, further collecting and investigation of this genus are still needed. Three known species *K. similis*, *K. martensi*, and *K. stysi* are distributed at the southern foot of the Himalayas, and nine newly described species *K. acutiformis* sp. nov., *K. bui* sp. nov., *K. caii* sp. nov., *K. drepanoides* sp. nov., *K. hilli* sp. nov., *K. pengae* sp. nov., *K. redeii* sp. nov., *K. renae* sp. nov., *K. weirauchae* sp. nov. are distributed at the eastern foot of the Himalayas, showing that this genus is mainly distributed in mountainous areas. The complex topography and varying climate of the Himalayas create a variety of habitat types, which are likely the reasons for the rich species diversity of the genus *Kokeshia* in such area.

The habits of *Kokeshia* are similar to those of other schizopterids, they live on the ground and in leaf litter, some species are associated with low herbaceous plants, mosses or under rotten trees. Previously, the detailed recorded habitats of this genus are: the type series of *K. esakii* was observed living on moss, mainly on *Conocephalus-Mnium* (Miyamoto, 1960); the type series of *K. stysi* was collected from moss growing on tree trunks (Rédei, 2008); the type series of *K. zhengi* was collected in a tobacco field by sweep-netting (Rédei *et al.*, 2012). The holotype of *K. similis* and type series of *K. martensi* were collected by sifting soil litter (Štys, 1985). The holotype of *K. oroszi* and the type series of *K. xiei* were collected at light (Rédei 2008; Rédei *et al.* 2012). In the present study, the type series of *K. bairi* sp. nov. was collected by pitfall trap; the type series of *K. acutiformis* sp. nov., *K. bui* sp. nov., *K. caii* sp. nov., *K. redeii* sp. nov., *K. renae* sp. nov. and non-type specimens of *K. hsiao* were collected at light; the type series of *K. pengae* sp. nov. was collected by hand collecting from leaf litter. A further three species, *K. drepanoides* sp. nov., *K. hilli* sp. nov., and *K. weirauchae* sp. nov., were collected by the first author from a temporary pool where cattle would bathe and cool down in Jinping county, Yunnan. This is an unusual habitat for schizopterids. On the one hand, such case may be an accidental appearance. On the other hand, eighteen individuals of three species were collected at this habitat and schizopterids usually prefer a highly humid habitat. In the future, it is still possible to collect large numbers of individuals of Schizopteridae in seasonally formed temporary pools.

Morphologically, *Kokeshia* is similar to *Caucanannus* and *Guapinannus* in welling-developed costal fracture; prominently thick C+Sc, R+M and R; R with only one branch; abdomen of male well sclerotized, and near symmetrical, with well-developed tergites. Although they are different in some wing and genital characteristics, they may still be the closest relatives. In the future, further taxonomic and systematic studies of *Kokeshia* should pay more attention to comparative morphological studies with *Caucanannus* and *Guapinannus*.

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