

# Checklist and key to species of the leafhopper genus *Japanagallia* Ishihara, 1955 with description of a new species from China (Hemiptera: Cicadellidae, Megophthalminae)

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Zhan, H. P., Li, H. & Dai R. H. 2018: Checklist and key to species of the leafhopper genus *Japanagallia* Ishihara, 1955 with description of a new species from China (Hemiptera: Cicadellidae, Megophthalminae). — Entomol. Fennica 29: 13–20.

A new leafhopper species, *Japanagallia turiformis* sp. n. of the tribe Agalliini of the subfamily Megophthalminae is described and illustrated from Yunnan Province and Guangxi Zhuang Autonomous Region of China. A checklist and key to the species of the genus are given, along with a map showing the geographical distributions of the 22 Chinese species.

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Received 30 November 2016, accepted 2 March 2017

## 1. Introduction

Ishihara (1955) established the leafhopper genus *Japanagallia* with *Agallia pteridis* Matsumura, 1905 (from Japan) as its type species. This genus is the largest group in the tribe Agalliini of the subfamily Megophthalminae (Hemiptera: Cicadellidae) within the Palaearctic and the Oriental regions, and most species are distributed in the southwest of China. Before this work, this genus contained 27 species, of which 21 had been recorded from China (Matsumura 1912, Viraktamath 1973, Li 1987, Zhang & Li 1999, Cai *et al.* 2001, Zhang 2010, Viraktamath 2011, Viraktamath *et al.* 2012, Li *et al.* 2014).

In this paper, a new species, *Japanagallia turiformis* sp. n., is described and illustrated from Yunnan Province and Guangxi Zhuang Autonomous Region of China. The genus *Japana-*

*gallia* now contains 28 species, of which 22 species occur in China. A checklist and key to the species of the genus are provided. A map showing the geographical distributions of the 22 Chinese species is also provided.

## 2. Materials and methods

The specimens were collected using a sweep net and light traps and examined under SZ2-ILST Olympus stereoscopic microscope. The morphological terminology and the classification systems follow Rakitov (1998), Dietrich (2005), and Viraktamath (2011). The terminology of the female genitalia follows Davis (1975). The zoogeographical regions of China follow Chen (1997) and Zhang (1998).

The type material of the new species is depos-

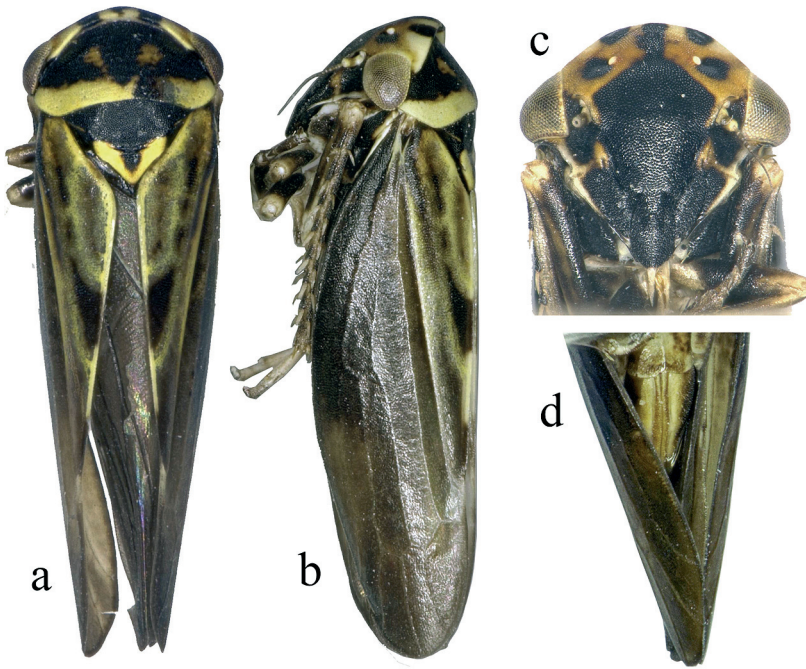


Fig. 1. *Japanagallia turiformis* sp. n., male holotype (a–c) and female paratype (d). – a. Dorsal view. – b. Lateral view. – c. Face. – d. Abdominal apex, ventral view.

ited in the Institute of Entomology, Guizhou University, Guiyang, China (GUGC).

### 3. Description of *Japanagallia turiformis* sp. n. (Figs. 1–3)

*Type material.* Holotype: male, China, Yunnan Province, Yuxi City, Mt. Ailaoshan, 2,400 m, 8.V.2015, Yunfei Wu & Jiajia Wang leg. (light trap). Paratypes: two females, same data as for holotype; one male, China, Yunnan Province, Yuxi City, Mt. Ailaoshan, 2,400 m, 8.V.2015, Yunfei Wu & Jiajia Wang leg. (sweep net); one male, China, Yunnan Province, Yuxi City, Mt. Ailaoshan, 2,377–2,400 m, 8.V.2015, Bin Yan leg. (light trap); one male, China, Guangxi Autonomous Zhuang Region, Tian'e County, Longtan Nature Reserve, Dashanlinchang, 18.VII.2015, Hongping Zhan leg. (sweep net). All in GUGC.

*Diagnosis.* Forewings with basal yellow-brown spots changing to chocolate terminally, small spine located basally on dorsal margin of aedeagal shaft, ventral margin with basal pair of spine like processes directed dorsally, ventral process of aedeagus pinnacle like in ventral view with end unbranched.

*Description.* Male. Body (Fig. 1a–b) slender. Face (Fig. 1c) across eyes slightly narrower than long; distance between ocelli approximately equal to distance between ocellus to adjacent eye; lateral margins of genae sinuated at middle. Pronotum wider than long, fore margin obviously prominent and slightly lower near eyes, hind margin slightly concave medially. Scutellum longer than pronotum. Forewings opaque, claval veins joined by two or three cross veins.

*Colouration.* Body black. Head (Fig. 1a) with a similar colour pattern as *Japanagallia trifurcata* Li, Dai & Li, 2014 with small brown spots on median line area, oval black spots on both sides. Face (Fig. 1c) yellowish brown, with inverted Y-shaped black mark on its upper median portion; anteclypeus, frontoclypeus, and lora black; ocelli milky white, with pair of black maculae near ocelli; eyes yellowish; antennal ledges with large black maculae. Pronotum black, posterior margins with yellow lateral band, quadrangular spot at right third; median line with two brown irregular spots on both sides. Scutellum black, with yellow lateral margins. Forewings (Fig. 1b) with yellow-brown basal spots, terminally chocolate, claval suture and claval veins yellowish. Legs yellowish, with brown spots.

*Male genitalia.* Pygofer (Fig. 2a) with caudal

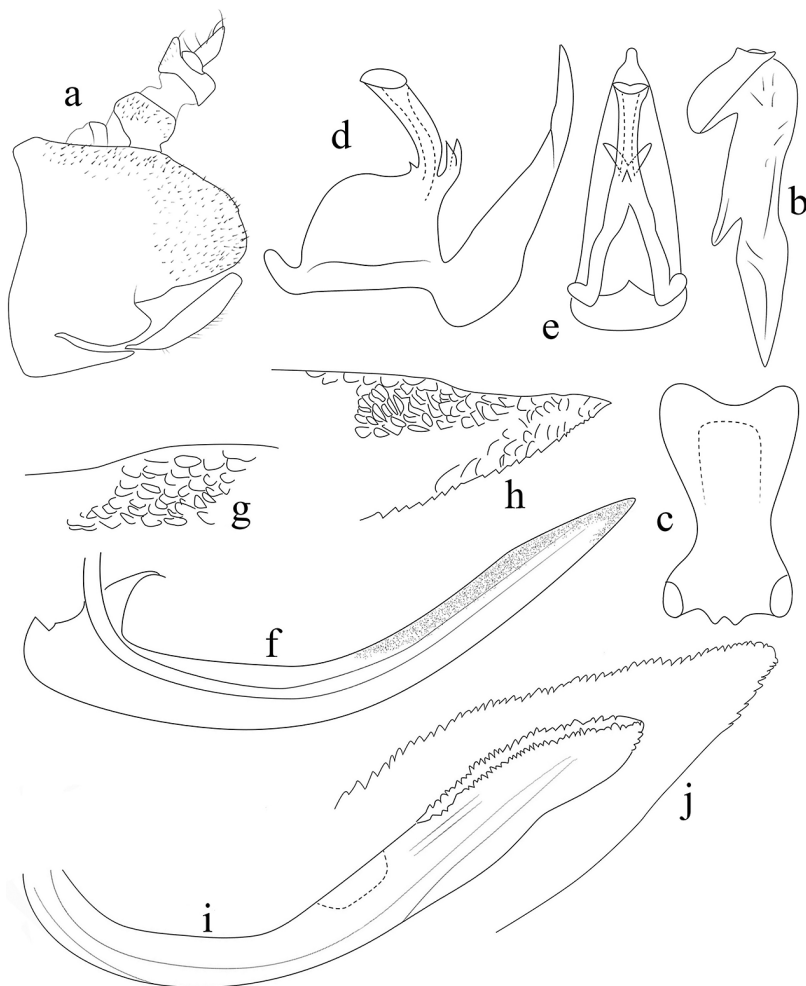


Fig. 2. *Japanagallia turiformis* sp. n. – a. Male genitalia and subgenital plate, lateral view. – b. Style, dorsal view. – c. Connective, dorsal view. – d. Aedeagus, lateral view. – e. Aedeagus, dorsal view. – f. Female 1<sup>st</sup> valvula, lateral view. – g. Part of female 1<sup>st</sup> valvula enlarged, lateral view. – h. Apex of female 1<sup>st</sup> valvula, lateral view. – i. Female 2<sup>nd</sup> valvulae, lateral view. – j. Apex of female 2<sup>nd</sup> valvula, lateral view.

lobe basally broad in lateral view, without process on mesal region, caudal margin approximately elliptical, dorsal and distal half with short and stout setae, ventrocaudal margin slightly elongated. Valve nearly semicircular, width approximately equal to length. Subgenital plates nearly triangular, with a few scattered microsetae, basal lateral margin slightly concave, freely attached to each other in basal part. Style (Fig. 2b) vertical and sturdy; inner arm slender and short, apex truncated and slightly expanded. Connective (Fig. 2c) anterior margin narrower than posterior margin, with two small lobes, lateral margins strongly concave, posterior margin slightly excavated medially. Aedeagus (Fig. 2d) dorsal apodeme widened in lateral view, rather trapezoidal, basal margin elongated; ventral process (Fig. 2e) well developed, slightly longer than shaft, pinnacled in

ventral view, tapered, then suddenly narrowing to subacute apex; shaft bent dorsally, ventral margin basally with a pair of spine like processes directed dorsally, dorsal margin with small spine basally; gonopore apical.

Female. Body colour slightly paler than in male.

Female genitalia. Seventh sternite (Fig. 1d) wider than long, posterior margin concavely excavated medially, both lateroposterior corners nearly rounded. Ovipositor apparently projected beyond pygofer. First valvulae (Fig. 2f–h) curved dorsally in lateral view; dorsolateral surface with reticulate sculptured area formed by oblique rows of scalelike processes on distal two-thirds of shaft; apex subacute. Second valvulae (Fig. 2i–j) curved dorsally in lateral view, with broadest region at apical fifth; dorsal hyaline area present,

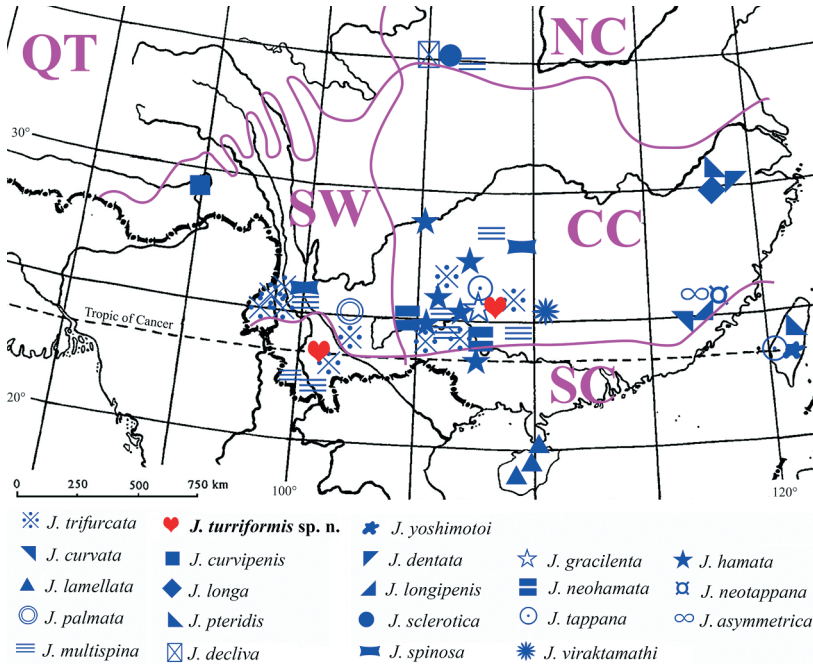


Fig. 3. Map of geographical distributions of *Japanagallia* species in China. Abbreviations: QT, Qinghai-Tibet; NC, north China; SW, southwest; CC, central China; SC, south China.

located nearly on median portion; teeth on apical part of dorsal margin positioned behind dorsal hyaline area, partly triangular, not forming denticles.

**Measurements.** Body length, including tegmen: male (holotype and paratypes), 3.9–4.0 mm; Female (paratypes), 4.1 mm.

**Distribution.** This species has been found in Yunnan Province and Guangxi Zhuang Autonomous Region, China (Fig. 3).

**Etymology.** The new species name is derived from the Latin word “turriformis”, referring to the aedeagus being pagodalike in ventral view.

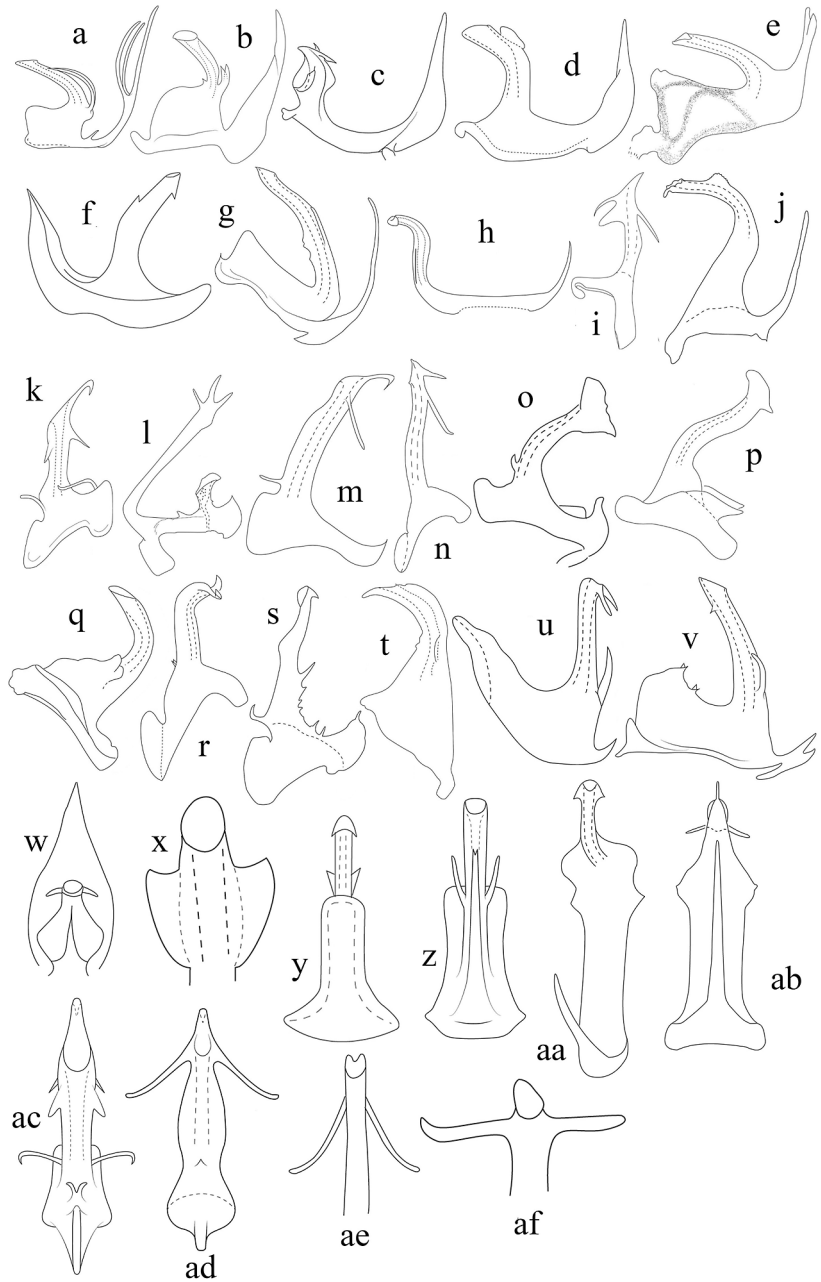
**Remarks.** This new species is similar to *J. trifurcata* but can be distinguished from the latter by the dorsal margin of the aedeagal shaft having a small spine basally, the ventral process of the aedeagus being pinnacle like in ventral view, and the end tapered, unbranched, then suddenly narrowing to a subacute apex.

**4. Key to males of *Japanagallia* species**

- 1 Aedeagus ventral process longer than aedeagal shaft 2
- Aedeagus ventral process equal or shorter than aedeagal shaft 4

- 2 Aedeagus ventral process trifurcate apically (Fig. 4a) *J. trifurcata*
- Aedeagus ventral process not trifurcate apically 3
- 3 Aedeagal shaft with pair of dorsally directed basal processes on ventral margin, dorsal margin with small basal spine (Fig. 4b) *J. turriformis* sp. n.
- Aedeagal shaft with pair of short ventrally directed preapical processes on ventral margin, dorsal margin without spine (Fig. 4c, w) *J. yoshimotoi*
- 4 Aedeagus ventral process well developed 5
- Aedeagus ventral process weakly developed 26
- 5 Aedeagal shaft with basal or subbasal processes 6
- Aedeagal shaft without basal or subbasal processes 14
- 6 Aedeagus asymmetrical 7
- Aedeagus symmetrical 10
- 7 Aedeagal shaft with series of spines of various sizes on midventral margin (Fig. 4s) *J. multispina*
- Aedeagal shaft without series of spines on midventral margin 8
- 8 Gonopore surrounded by collar of uneven width (Fig. 5b, h) *J. malaisei*

Fig. 4. Male aedeagus of *Japanagallia* species from China, lateral view (a–v), anterodorsal view (w); apex of aedeagal shaft (x, ae, af), ventral view (y, z), ventrolateral view (aa), caudal view (ab), dorsal view (ac–ad). – a. *J. trifurcata* (Li, Dai & Li). – b. *J. turrimiformis* sp. n. – c, w. *J. yoshimotoi* (Viraktamath). – d, x. *J. curvata* (Viraktamath). – e. *J. curvipenis* (Viraktamath, Dai & Zhang). – f, y. *J. dentata* (Cai & He). – g, z. *J. gracilentata* (Li, Dai & Li). – h, aa. *J. lamellata* (Zhang). – i. *J. longa* (Cai & He). – j, ab. *J. sclerotica* (Viraktamath, Dai & Zhang). – k, ac. *J. neohamata* (Li, Dai & Li). – l. *J. palmata* (Viraktamath, Dai & Zhang). – m, ad. *J. hamata* (Li, Dai & Li). – n, ae. *J. longipenis* (Viraktamath). – o. *J. tappana* (Viraktamath). – p. *J. neotappana* (Viraktamath). – q. *J. pteridis* (Viraktamath). – r, af. *J. asymmetrica* (Viraktamath). – s. *J. multispina* (Viraktamath, Dai & Zhang). – t. *J. decliva* (Viraktamath, Dai & Zhang). – u. *J. spinosa* (Zhang). – v. *J. viraktamathi* (Li, Dai & Li).



- Gonopore not surrounded by collar 9
- 9 Aedeagal shaft with two triangular processes on lateral margin apically, with two arcuate and lamellate processes near base laterally (Fig. 4h, aa) *J. lamellata*
- Aedeagal shaft bearing two short laterally directed processes apically, and pair of toothlike processes at base on dorsal margin (Fig. 4r, af) *J. asymmetrica*
- 10 Aedeagus with long slender processes 11
- Aedeagus with short stout processes 12
- 11 Aedeagal shaft with pair of long processes subapically on lateral margin (Fig. 4m, ad) *J. hamata*
- Aedeagal shaft with pairs of spinelike processes subapically, separately on dorsal and ventral margins (Fig. 4k, ac) *J. neohamata*

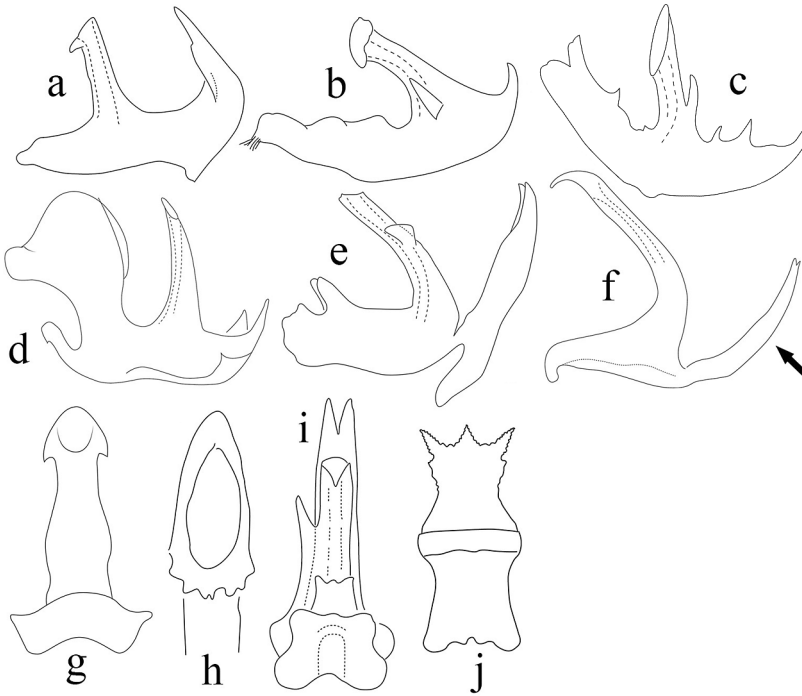


Fig. 5. Male aedeagus of *Japanagallia* species from outside China in the Oriental region, lateral view (a–f), dorsal view (g); apex of aedeagal shaft, anterior view (h), anterodorsal view (i); ventral process of aedeagus as seen from the direction of arrow in f (j). – a, g. *J. javana* (Viraktamath). – b, h. *J. malaisei* (Viraktamath). – c. *J. mussooriensis* (Viraktamath). – d. *J. nepalensis* (Viraktamath). – e, i. *J. peculiaris* (Viraktamath). – f, j. *J. sumatrana* (Viraktamath).

- 12 Aedeagus anchor-shaped in lateral view (Fig. 5c) *J. mussooriensis*
- Aedeagus not anchor-shaped in lateral view 13
- 13 Aedeagus L-shaped in lateral view, shaft with pair of hooks at base on dorsal margin (Fig. 4o) *J. tappana*
- Aedeagus not L-shaped in lateral view, shaft with pair of short processes at base on dorsal margin (Fig. 4q) *J. pteridis*
- 14 Aedeagus U-shaped in lateral view 15
- Aedeagus not U-shaped in lateral view 16
- 15 Aedeagal shaft dorsally curved about mid length dorsally, with pair of winglike processes of varying size subapically (Fig. 4d, x) *J. curvata*
- Aedeagal shaft erect, with pair of short processes apically (Fig. 5a, g) *J. javana*
- 16 Aedeagus rather F-shaped in lateral view (Fig. 5d) *J. nepalensis*
- Aedeagus not F-shaped in lateral view 17
- 17 Aedeagus dorsal apodeme with pair of long bladlike processes distally, and their distal region slightly expanded and branched into three digitate processes (Fig. 4l) *J. palmate*
- Aedeagus dorsal apodeme without pair of long bladlike processes distally 18
- 18 Aedeagal shaft with two platelike processes laterally at base (Fig. 4p) *J. neotappana*
- Aedeagal shaft without platelike process laterally at base 19
- 19 Aedeagus ventral process with three pronglike apical prolongations, lateral margin serrate (Fig. 5f, j) *J. sumatrana*
- Aedeagus ventral process not as above 20
- 20 Aedeagus ventral process forked apically 21
- Aedeagus ventral process not forked apically 23
- 21 Aedeagal shaft with short spatulate process on left hand side (Fig. 5e, i) *J. peculiaris*
- Aedeagal shaft without short spatulate process on left hand side 22
- 22 Aedeagal shaft with irregularly serrated processes in basal half of dorsal margin, and with pair of dorsally directed spinelike processes on midventral margin (Fig. 4g, z) *J. gracilentata*
- Aedeagal shaft without processes (Fig. 4e) *J. curvipenis*
- 23 Aedeagal shaft with shallow oblique ridge processes in middle of dorsal margin and end of ventral margin (Fig. 4f, y) *J. dentata*
- Aedeagal shaft without oblique ridge process in middle of dorsal margin and end of ventral margin 24

Table 1. Checklist and distribution of *Japanagallia* species.

Species	Distribution
<i>J. asymmetrica</i> Viraktamath, 2011 (Fig. 4r, af)	China (Fujian prov.)
<i>J. curvata</i> Viraktamath, 2011 (Fig. 4d, x)	China (Fujian prov.)
<i>J. curvipenis</i> Viraktamath, Dai & Zhang, 2012 (Fig. 4e)	China (Xizang prov.)
<i>J. decliva</i> Viraktamath, Dai & Zhang, 2012 (Fig. 4t)	China (Shaanxi prov.)
<i>J. dentata</i> Cai & He, 2001 (Fig. 4f, y)	China (Zhejiang prov.)
<i>J. gracilentata</i> Li, Dai & Li, 2014 (Fig. 4g, z)	China (Guangxi prov.)
<i>J. hamata</i> Zhang & Li, 1999 (Fig. 4m, ad)	China (Guizhou, Guangxi prov.)
<i>J. javana</i> Viraktamath, 2011 (Fig. 5a, g)	Indonesia
<i>J. lamellata</i> Zhang, 2010 (Fig. 4h, aa)	China (Hainan prov.)
<i>J. longa</i> Cai & He, 2001 (Fig. 4i)	China (Zhejiang prov.)
<i>J. longipenis</i> Viraktamath, 2011 (Fig. 4n, ae)	China (Fujian prov.)
<i>J. malaisei</i> Viraktamath, 2011 (Fig. 5b, h)	Myanmar
<i>J. multispina</i> Viraktamath, Dai & Zhang, 2012 (Fig. 4s)	China (Shaanxi, Yunnan, Guizhou, Guangxi prov.)
<i>J. mussooriensis</i> Viraktamath, 2011 (Fig. 5c)	India
<i>J. neohamata</i> Li, Dai & Li, 2014 (Fig. 4k, ac)	China (Guizhou, Guangxi prov.)
<i>J. neotappana</i> Viraktamath, 2011 (Fig. 4p)	China (Fujian prov.)
<i>J. nepalensis</i> Viraktamath, 2011 (Fig. 5d)	Nepal
<i>J. palmata</i> Viraktamath, Dai & Zhang, 2012 (Fig. 4l)	China (Yunnan prov.)
<i>J. peculiaris</i> Viraktamath, 2011 (Fig. 5e, i)	Nepal
<i>J. pteridis</i> (Matsumura, 1905) (Fig. 4q)	China (Zhejiang, Taiwan prov.), Japan, Korea, Russia
<i>J. sclerotica</i> Viraktamath, Dai & Zhang, 2012 (Fig. 4j, ab)	China (Shaanxi prov.)
<i>J. spinosa</i> Zhang, 2010 (Fig. 4u)	China (Guizhou, Yunnan prov.)
<i>J. sumatrana</i> Viraktamath, 2011 (Fig. 5f, j)	Indonesia
<i>J. tappana</i> (Matsumura, 1912) (Fig. 4o)	China (Guizhou, Taiwan prov.)
<i>J. trifurcata</i> Li, Dai & Li, 2014 (Fig. 4a)	China (Guizhou, Yunnan, Guangxi prov.)
<i>J. turiformis</i> <b>sp. n.</b> (Fig. 4b)	China (Yunnan, Guangxi prov.)
<i>J. viraktamathi</i> Li, Dai & Li, 2014 (Fig. 4v)	China (Guangxi prov.)
<i>J. yoshimotoi</i> Viraktamath, 2011 (Fig. 4c, w)	China (Taiwan prov.)

24 Aedeagal shaft with a horn and spinelike process apically on dorsal margin, with long sheetlike process on ventral margin (Fig. 4i)

*J. longa*

– Aedeagal shaft without processes as above 25

25 Aedeagal shaft with unpaired short apical process directed ventrally and pair of ventrally directed longer subapical processes (Fig. 4n, ae)

*J. longipenis*

– Aedeagal shaft with fingerlike lateral processes apically on either side of apical gonopore and a subapical crest on ventral margin (Fig. 4j, ab)

*J. sclerotica*

26 Aedeagus dorsal apodeme strongly developed, angulate, with small spines (Fig. 4v)

*J. viraktamathi*

– Aedeagus dorsal apodeme not angulate or poorly developed, without small spine 27

27 Aedeagus with spinelike processes on ventral margin (Fig. 4u)

*J. spinosa*

– Aedeagus without spinelike process on ventral margin (Fig. 4t)

*J. decliva*

## 5. Discussion

To date, 22 species of *Japanagallia* are distributed in the four regions of China (Chen 1997, Zhang 1998): three in north China, sixteen in central China, eight in south China, and five in the southwest region (Fig. 3). Other 6 species of *Japanagallia* are distributed in the four countries of the Oriental region (Table 1).

Some species of *Japanagallia* are very similar to each other, but the structure of aedeagus is markedly different (Figs 4, 5). The 28 species of *Japanagallia* can be divided into three types based on the structure of aedeagus. Type 1 includes three species (*J. trifurcata*, *J. turiformis* **sp. n.** and *J. yoshimotoi*), with the ventral process of the

aedeagus well developed, and longer than the aedeagal shaft. Type 3 includes also three species (*J. decliva*, *J. spinosa* and *J. viraktamathi*); their ventral process of the aedeagus is weakly developed. Type 2 includes the rest or twenty-two species, with the ventral process of the aedeagus being well-developed, but equal or shorter than the aedeagal shaft.

*Acknowledgements.* We are grateful to Yunfei Wu, Bin Yan, and Jiajia Wang for collecting specimens, and to anonymous reviewers for providing useful suggestions on the manuscript. This work was supported by the National Natural Science Foundation of China (no. 31360524).

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