

# Species diversity of the genus *Phortica* Schiner in Yunnan, China, with descriptions of nine new species (Diptera, Drosophilidae)

HONG-WEI CHEN<sup>1</sup>, JIAN-JUN GAO<sup>2</sup>, & SHUO-YANG WEN<sup>1</sup>

<sup>1</sup>Department of Entomology, South China Agricultural University, Guangzhou, China, <sup>2</sup>Laboratory for Conservation and Utilization of Bio-resource, Yunnan University, Kunming, China

(Accepted 20 December 2005)

## Abstract

This paper deals with a total of 29 species of the genus *Phortica* from Yunnan, including nine new species: *acongruens* (Zhang and Shi), *bicornuta* (Chen and Toda), *bipartita* (Toda and Peng), *biprotrusa* (Chen and Toda), *cardua* (Okada), *eugamma* (Toda and Peng), *excrecentiosa* (Toda and Peng), *flexuosa* (Zhang and Gan), *gamma* (Toda and Peng), *hani* (Zhang and Shi), *lambda* (Toda and Peng), *omega* (Okada), *protrusa* (Zhang and Shi), *pseudogigas* (Zhang and Gan), *pseudopi* (Toda and Peng), *pseudotau* (Toda and Peng), *saeta* (Zhang and Gan), *speculum* (Máca and Lin), *subradiata* (Okada), *tau* (Toda and Peng), *glabtabula* Chen and Gao, sp. nov., *latipenis* Chen and Gao, sp. nov., *longipenis* Chen and Gao, sp. nov., *pangi* Chen and Wen, sp. nov., *sagittaristula* Chen and Wen, sp. nov., *saltiaristula* Chen and Wen, sp. nov., *setitabula* Chen and Gao, sp. nov., *uncinata* Chen and Gao, sp. nov., and *unipetala* Chen and Wen, sp. nov. A key to all species examined of the genus *Phortica* from Yunnan, China, is provided.

**Keywords:** *Diptera*, *Drosophilidae*, *Phortica*, *new species*, *Yunnan*, *China*

## Introduction

The genus *Phortica* was originally established by Schiner (1862), but regarded as a subgenus of *Amiota* by Wheeler since 1952, and recently transferred back to generic rank by Máca (2003). Adult *Phortica* species are usually found hovering in front of people's eyes in wooded areas, resting on tree trunks, or breeding in the sap of trees, occasionally entering banana traps. Some species are intermediate hosts of the Oriental eye worm (*Thelazia callipaeda*), a small nematode causing parasitic eye disease (Kamakura et al. 1998; Wang et al. 1998).

The landscape of Yunnan Province is characterized by high mountains in its northwest part, a broad plateau in the central part, and lowlands along its eastern, southeastern and southern borders. This topography brings a so-called three-dimensional differentiation of

climate and diverse vegetation (Li and Xue 1997), e.g., temperate deciduous forest mixed with conifers in the northwestern part, ever-green broad-leaved forest in the central part, and tropical rainforest along the southern border. Until now, a total of 14 *Phortica* species have been reported from Yunnan (Zhang and Gan 1986; Chen and Toda 1997, 1998; Zhang and Shi 1997; Zhang et al. 1996). Since 2000, we have surveyed the drosophilid fauna of Yunnan in some districts for four years: Mts. Gaoligong, Pianma; Ninglang; Mts. Jizu, Binchuan; Kunming (Bamboo Temple); Mts. Wuliang; Nanjian; Mts. Ailiao, Jingdong; Simao (Yixiang) and Xishuangbanna (Mengyang, Menglun and Mengla) (Figure 1). A total of 29 species (including seven new records and nine new species, accounting for about 36% of the world total) of the genus *Phortica* are found in these districts, and known only from the Oriental Region, and 12 species of them are known only from Yunnan. Sampling so far thus indicates that Yunnan is a region of unusually high species diversity for the genus *Phortica*. The two new species *P. sagittaristula* and *P. pangi* are also found from Guangxi and Hainan Provinces, southern China and reported together in this study.

Type specimens will be deposited in the following institutions: Kunming Institute of Zoology, Chinese Academy of Sciences, Kunming, China (KIZ); Department of Entomology, South China Agricultural University, Guangzhou, China (SCAU); Systematic Entomology, The Hokkaido University Museum, Hokkaido University, Sapporo, Japan (SEHU). Seven new records are indicated by an asterisk (\*). Most of the

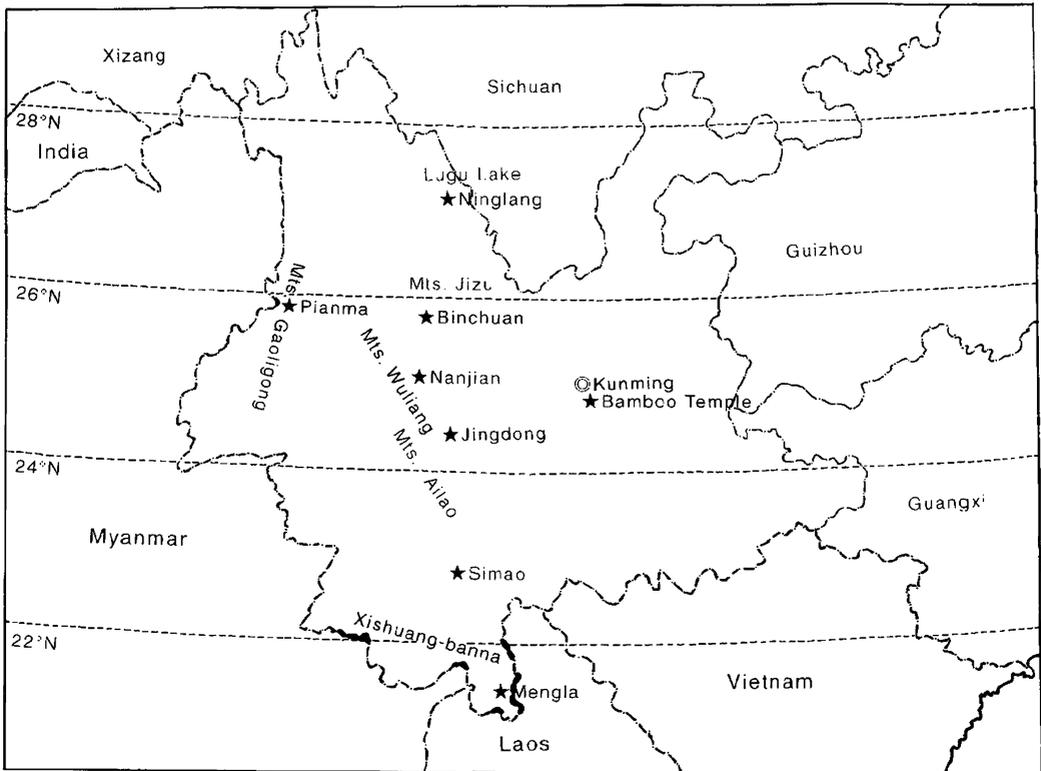


Figure 1. Map of Yunnan Province, indicating eight main localities.

flies examined were collected around human eyes, and this fact is therefore not mentioned in every description.

### Genus *Phortica* Schiner

*Phortica* Schiner 1862, p 433 (as a genus).

Type species: *Drosophila variegata* Fallén, 1823; Máca 2003, p 251 (revised status).

*Amiota* (*Phortica*): Wheeler 1952, p 167.

#### *Diagnosis*

Ocellar tubercle with additional pair of small setae below; proclinate orbital seta nearer to inner vertical seta than to ptilinal fissure; palpus with hollow sense organ; aedeagal apodeme laterally flattened.

#### *Description*

*Head.* Eyes red-brown. Ocellar triangle brown to black. Fronto-orbital plate silvery white. Pedicel and first flagellomere grey-yellow. Face grey-yellow to dark brown, with yellow-white patches lower laterally. Clypeus medially white, laterally black. Gena grey-brown; postgena dark brown. Palpus somewhat triangular, grey-yellow distally, brown basally, with one hollow sense organ subapically and a few setae distally. Vibrissa prominent; other oral setae small. Occiput glossy, brown-black.

*Thorax.* Yellow to orange-brown, usually with brown to black patches and a pollinose pattern. Postpronotal lobe pale yellow, with one long and three to five short setae. Acrostichal setulae in about 10 irregular rows. Prescutellar setae present. Anepisternum usually without setulae, Scutellum usually concolorous with thorax. Basal scutellar setae divergent; scutellar apicals crossing each other.

*Wing.* Hyaline, sometimes smoky; veins grey-yellow. Basal medial-cubital crossvein present;  $C_1$  setae two, less differentiated. Costal vein with spinules on ventral surface between  $R_{2+3}$  and  $R_{4+5}$ .  $R_{2+3}$  slightly curved to costa at tip;  $R_{4+5}$  distally convergent with  $M_1$ . Halteres white.

*Legs.* Yellow. Fore femur with two to three irregular rows of long setae on posterior surface. Preapical dorsal setae present on all tibiae. Mid tarsus ventrally with two rows of minute cuneiform setulae on inner and outer sides; hind tarsus with one row of such setulae on underside; fore and hind first tarsomeres each as long as three succeeding tarsomeres together; mid first tarsomere as long as other tarsomeres combined.

*Abdomen.* First to fifth tergites yellow to orange, with brown to black patches or posterior bands. Sixth tergite nearly entirely black. Sternites usually grey-yellow.

*Male terminalia.* Epandrium with pubescence and setae. Cercus separated from epandrium, entirely pubescent and setigerous. Membrane between epandrium and cercus pubescent. Hypandrium arched, usually with two developed apodeme processes on the anterior portion; posterior ends contiguous to posterolateral corners of gonopod and anteroventral corners of epandrium. Gonopods fused to each other, forming

posteromedian plate, anteriorly forming vertical process, posterolaterally contiguous with posterior ends of hypandrium and anteroventral corners of epandrium. Parameres usually basally contiguous with anterior portion of hypandrium and tips of distally bifurcated aedeagal guide. Aedeagus composed of outer membranous tube and more or less sclerotized median rod; outer membrane posteriorly connected to vertical process of gonopod; basally connected to basal corners of gonopod by a pair of bridges and contiguous with guide of aedeagal apodeme.

**The *foliiseta* species-complex**

*Amiota* (*Phortica*) *foliiseta* species-complex, Tsacas and Okada 1983, p 229.

*Diagnosis*

Interfrontal setae thick and dense; male arista usually swollen apically; tenth sternite absent; paramere short, rod-shaped, apically knobbed, basally with a few sensilla modified form (Tsacas and Okada 1983).

***Phortica speculum*** (Máca and Lin)

*Amiota* (*Phortica*) *speculum* Máca and Lin 1993, p 172.

*Material examined*

Yunnan: Simao, Yixiang, 1200 m alt., 5♂ (3♂, ex tree trunks), 15 September 2002, H.-W. Chen.

*Distribution*

China (Taiwan, Yunnan\*).

***Phortica sagittaristula*** Chen and Wen, sp. nov.

(Figure 2)

*Diagnosis*

Arista apically arrow-shaped (Figure 2A); right lateral lobe of vertical process of gonopod with two pointed projections basally (Figure 2C)

*Description*

*Head.* Frons and face brown; gena brown-yellow.

*Thorax.* Thorax and scutellum yellow-brown, with brown patches and a pollinose pattern. Katepisternum brown-black.

*Wing.* r-m and dm-cu crossveins not clouded.

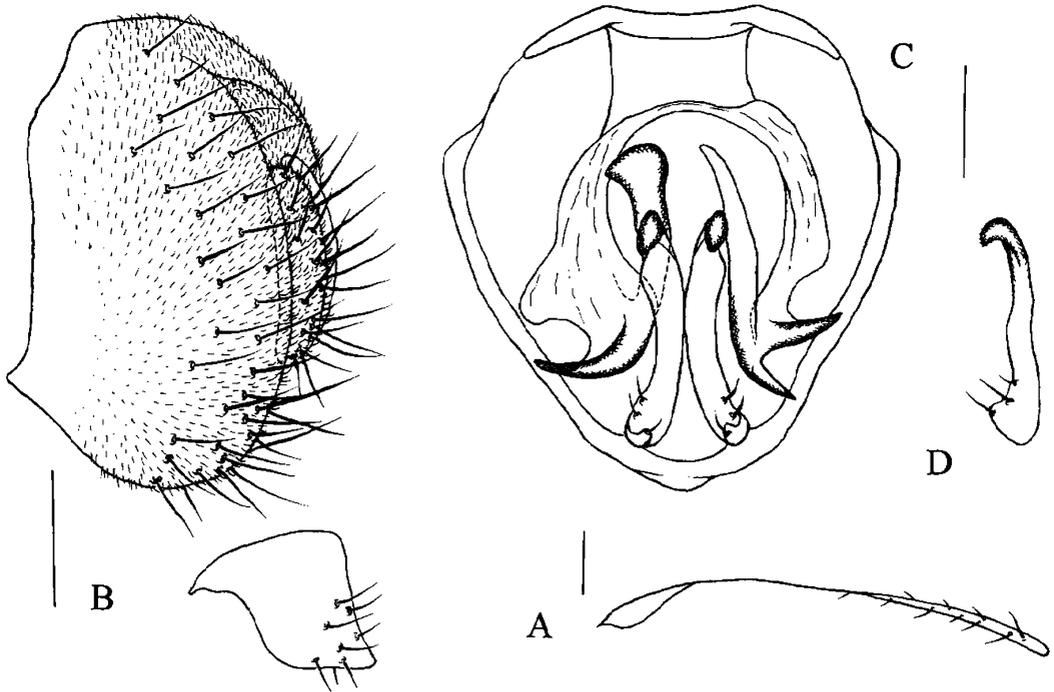


Figure 2. *Phortica sagittaristula* Chen and Wen, sp. nov., ♂. (A) Arista; (B) epandrium, cercus and surstylus (lateral view); (C) hypandrium, gonopod and parameres (ventral view); (D) paramere (lateral view). Scale bars: 0.1 mm.

*Legs.* Legs lacking dark spots and dark rings. Empodium of fore legs developed more than on the other legs.

*Abdomen.* Abdominal third to fifth tergites each with a brown band neither interrupted medially nor extended to lateral margins. Third sternite distinctly broadened, shorter than wide, with several long setae laterally; fourth sternite slightly longer than wide; fifth sternite longer than wide, with a few long setae laterally.

*Male terminalia.* Epandrium constricted mid-dorsally, laterally broad, almost entirely pubescent, with dense long setae near dorsal and posterior margins (Figure 2B). Surstylus mostly covered, with several setae on inner surface (Figure 2B). Cercus narrow. Vertical process of gonopod divided medially, basal projections pointed, apical processes round or expanded (Figure 2C). Paramere slightly curved distally, basally with three sensilla (Figure 2C, D). Median rod of aedeagus very short, unsclerotized; outer membrane undeveloped.

*Measurements.* BL=2.38 mm in holotype (2.30 in 1♂ paratype); ThL=1.20 mm (1.10); WL=2.26 mm (2.20); WW=1.00 mm (1.00).

*Indices.* arb=0/0 (0/0), flw=1.20 (1.20), FW/HW=0.40 (0.40), ch/o=0.06 (0.06), prorb=1.15 (1.10), rcorb=0.60 (0.65), vb=0.40 (0.50), dcl=0.40 (0.55), presctl=0.60 (0.55), sctl=1.10 (1.10), sterno=1.00 (1.00), orbito=1.30 (1.30), dcp=0.25 (0.25), sctlp=1.20 (1.20), C=2.00 (2.27), 4c=1.67 (1.50), 4v=2.89 (2.75), 5x=1.00 (1.00), ac=3.00 (3.00), M=0.67 (0.60), C3F=0.61 (0.61).

Holotype: ♂, Yunnan: Xishuangbanna, Menglun, Xishuangbanna Tropical Botanical Garden, 740 m alt., 12 August 2002, M. J. Toda (SCAU). Paratype: 1♂, same data as holotype except 26 December 2003, H.-W. China (SCAU). Guangxi: Fushui, Bapeng, alt. 230 m, 15♂, 5♀ (9♂, 5♀, ex tree trunks), 23 August 2004, X.-L. Dang and H.-W. Chen (3♂, KIZ; 9♂, 5♀, SCAU; 3♂, SEHU).

*Distribution*

China ( Guangxi, Yunnan).

*Relationships*

This species is very similar to *P. foliiseta* Duda, 1923 from Taiwan in the shapes of the arista and gonopod, but differs from it in having the arista and right lateral lobe of vertical process of gonopod (in *P. foliiseta*: arista basally with two long dorsal branches, and right lateral lobe of vertical process of gonopod with one pointed projection).

***Phortica saltiaristula* Chen and Wen, sp. nov.**  
(Figure 3)

*Diagnosis*

Tip of arista broadened (Figure 3A); right lateral lobe of vertical process of gonopod with one pointed projection basally (Figure 3C); paramere strongly curved distally (Figure 3C, D).

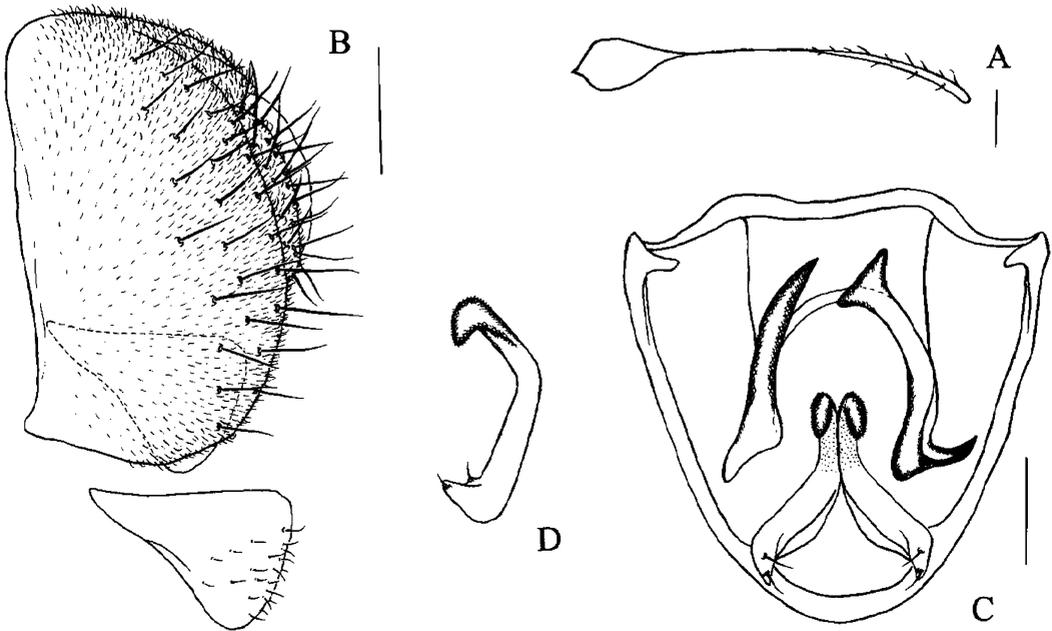


Figure 3. *Phortica saltiaristula* Chen and Wen, sp. nov., ♂. (A) Arista; (B) epandrium, cercus and surstylus (lateral view); (C) hypandrium, gonopod and parameres (ventral view); (D) paramere (lateral view). Scale bars: 0.1 mm.

Some characters commonly seen also in *P. sagittaristula* sp. nov. are not referred to in the following description.

### *Description*

*Abdomen.* Third to fifth tergites each with a brown posterior band, interrupted medially.

*Male terminalia.* Vertical process of gonopod with left projection pointed, right projection round; apical processes slightly pointed (Figure 3C). Paramere strongly curved distally, basally with two sensilla (Figure 3C, D). Median rod of aedeagus very short, unsclerotized; outer membrane slightly developed.

*Measurements.* BL=2.92 mm (range paratypes 4♂: 2.50–3.00); ThL=1.20 mm (1.10–1.25); WL=2.30 mm (2.20–2.40); WW=1.00 mm (1.00).

*Indices.* arb=0/0 (0/0), flw=1.20 (1.20–1.30), FW/HW=0.40 (0.35–0.40), ch/o=0.05 (0.05–0.06), prorb=1.10 (1.10–1.40), rcorb=0.70 (0.60–0.70), vb=0.30 (0.30–0.40), dcl=0.55 (0.50–0.60), presctl=0.60 (0.60–0.65), sctl=1.10 (1.10), sterno=1.00 (1.00), orbito=1.50 (1.45–1.60), dcp=0.27 (0.26–0.28), sctlp=1.20 (1.20–1.30), C=2.14 (2.09–2.28), 4c=1.75 (1.52–1.88), 4v=3.20 (2.86–3.65), 5x=1.07 (1.00–1.25), ac=3.19 (2.90–3.20), M=0.80 (0.71–0.88), C3F=0.66 (0.57–0.66).

*Holotype:* ♂, Yunnan: Xishuangbanna, Menglun, 940 m alt., 8 March 2003, M. J. Toda (SCAU). *Paratypes:* 3♂, same data as holotype (SCAU); 6♂, same data as holotype except 24–26 December 2003, S.-Y. Wen and H.-W. Chen (3♂, KIZ; 3♂, SEHU).

### *Distribution*

China (Yunnan).

### *Relationships*

This species is very similar to *P. sagittaristula* sp. nov. in having the arista without dorsal branches, and in the shape of the gonopod, but differs from the latter species by their diagnostic characters.

## ***Phortica longipenis* Chen and Gao, sp. nov.** (Figure 4)

### *Diagnosis*

Arista medially with a belonoid process (Figure 4A); vertical process of gonopod strongly sclerotized, forming continuous arch, and with a few processes (Figure 4C); aedeagal outer membrane with numerous spine-like spinules (Figure 4C).

Some characters commonly seen also in *P. sagittaristula* sp. nov. are not referred to in the following description.

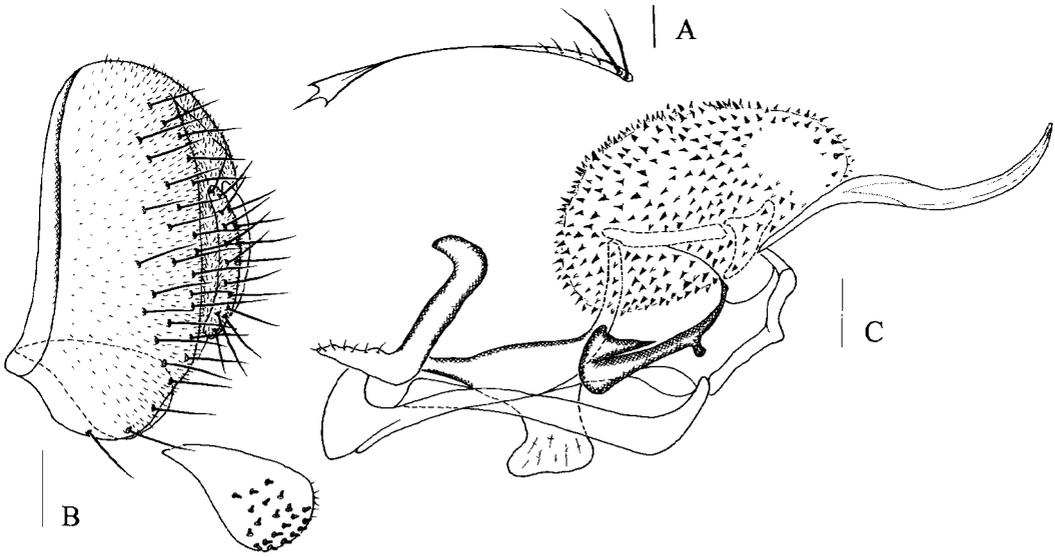


Figure 4. *Phortica longipenis* Chen and Gao, sp. nov., ♂. (A) Arista; (B), epandrium, cercus and surstylus (lateral view); (C) hypandrium, gonopod, parameres and aedeagal median rod (ventral view). Scale bars: 0.1 mm.

### Description

**Head.** Frons and face nearly black; gena brownish black.

**Thorax.** Thorax orange brown, with black patches and pollinose pattern. Scutellum black, brown on tip.

**Wing.** r-m and dm-cu crossveins clouded.

**Abdomen.** Third and fourth tergites each with a brown-black posterior band, interrupted medially; fifth and sixth tergites nearly entirely brown-black. Third to fifth sternites distinctly broadened, shorter than width, with several long setae laterally.

**Male terminalia.** Surstylus covered with epandrium, with about 22 peg-like prenisetae arranged irregularly on its apical margin to inner surface (Figure 4B). Paramere basally elongated, with five to seven sensilla (Figure 4C). Median rod of aedeagus long, unsclerotized (Figure 4C).

**Measurements.** BL=3.94 mm (range paratypes 5♂: 3.50–4.16); ThL=1.89 mm (1.74–1.90); WL=3.13 mm (3.00–3.30); WW=1.31 mm (1.20–1.32).

**Indices.** arb=2 (2–3/0), adf=1.20 (1.00–1.20), flw=1.30 (1.20–1.30), FW/HW=0.35 (0.35–0.40), ch/o=0.08 (0.07–0.09), prorb=1.15 (1.18–1.25), rcorb=0.55 (0.50–0.60), vb=0.50 (0.40–0.50), dcl=0.50 (0.50–0.55), presctl=0.85 (0.85–0.90), sctl=1.00 (1.00–1.05), sterno=0.90 (0.85–1.00), orbito=1.90 (1.80–2.00), dcp=0.22 (0.20–0.25), sctlp=1.30 (1.10–1.30), C=2.88 (2.11–2.41), 4c=1.14 (1.39–1.58), 4v=2.50

(2.50–2.85),  $5x=1.00$  (1.00),  $ac=3.20$  (3.40–3.80),  $M=0.57$  (0.58–0.62),  $C3F=0.69$  (0.63–0.74).

Holotype: ♂, Yunnan: Mt. Jizhu, Binchuan, 1700–1900 m alt., 17–18 August 2000, H.-W. Chen (SCAU). Paratypes: 55♂, same data as the holotype (10♂, KIZ; 35♂, SCAU; 10♂, SEHU).

*Distribution*

China (Yunnan).

*Relationships*

This species resembles *P. foliacea* (Tsacas and Okada, 1983) from Taiwan in having the aedeagal outer membrane with distinct spinules, but differs from it in the shape of the arista tip and the vertical process of gonopod (in *P. foliacea*: arista tip with one process near lateral margin, vertical process of gonopod sclerotized with a few processes). This species is also similar to *P. nigrifoliiseta* (Takada et al., 1973) from eastern Malaysia in the shape of the vertical process of gonopod, but can be distinguished from it by the distinct spinules on the aedeagal outer membrane (in *P. nigrifoliiseta* having only minute warts).

**The *magna* species-complex**

*Amiota (Phortica) magna* species-complex Chen and Toda 1997, p 785.

*Diagnosis*

Surstylus with black, long, thick spine-like prenisetae; additional plate between cerci and tenth sternite lacking pubescence and separated from tenth sternite.

***Phortica bicornuta* (Chen and Toda)**

*Amiota (Phortica) bicornuta*; Chen and Toda 1997, p 786.

*Material examined*

Yunnan: Kunming, Bamboo Temple, 2100 m alt., 67♂, 22♀, 23, 31 July, 2000, 4 August 2000, J.-J. Gao and H.-W. Chen. Mt. Jizuo, Binchuan, 1900 m alt., 10♂, 17–19 July 2000, H.-W. Chen. Simao, Yixiang, 1400 m alt., 8♂, 4♀, 5–6 December 2000, J.-J. Gao. Xishuangbanna, Menglun, 940 m alt., 23♂, 24–26 December 2003, S.-Y. Wen and H.-W. Chen.

*Distribution*

China (Yunnan).

**The *omega* species-complex**

*Amiota (Phortica) omega* species-complex, Chen and Toda 1998, p 403.

*Diagnosis*

Paramere bifurcated basally: two long, narrow processes.

***Phortica biprotrusa*** (Chen and Toda)

*Amiota (Phortica) biprotrusa* Chen and Toda 1998, p 404.

*Material examined*

Yunnan: Kunming, Bamboo Temple, 2100 m alt., 5♂, 31 July and 4 August 2000, J.-J. Gao and H.-W. Chen. Xishuangbanna, Menglun, 940 m alt., 3♂, 8 March 2003, M. J. Toda.

*Distribution*

China (Yunnan).

***Phortica omega*** (Okada)

*Amiota (Phortica) magna* Okada 1977, p 21; Chen and Toda 1998, p 404.

*Material examined*

Yunnan: Kunming, Bamboo Temple, 2100 m alt., 1♂, 5 May 2002, J.-J. Gao. Mt. Jizu, Binchuan, 1800 m alt., 3♂, 17 August 2000, H.-W. Chen. Xishuangbanna: Mengyang, 800 m alt., 2♂, 14 September 2002, H.-W. Chen, Menglun, 740 m alt., 3♂, 3–4 November 2001, L.-P. He and H. Watabe; 1♂, 8 March 2003, 15♂, 22 September 2003, 24–26 December 2003, M. J. Toda, S.-Y. Wen, and H.-W. Chen.

*Distribution*

China (Yunnan); Thailand.

**The *variegata* species-complex**

*Amiota (Phortica) variegata* species-complex, Máca 1977, p 115.

*Diagnosis*

Paramere tripartite distally.

***Phortica acongruens*** (Zhang and Shi)

*Amiota (Phortica) acongruens* Zhang and Shi 1997, p 368.

*Material examined*

Yunnan: Lijiang, Ninglang, 2800 m alt., 3♂, 23 July 2001, J.-J. Gao. Mt. Jizu, Binchuan, 1800 m alt., 24♂, 17–19 August 2000, L.-P. He, J.-G. Xiangyu, H. Takamori, H. Watabe, and H.-W. Chen. Mt. Wuliang, Nanjian, 1900 m alt., 1♂, 1 July 2001, J.-J. Gao. Simao, Yixiang, 1400 m alt., 3♂, 5–6 December 2000, J.-J. Gao.

*Distribution*

China (Anhui, Yunnan).

***Phortica eugamma*** (Toda and Peng)

*Amiota (Phortica) eugamma* Toda and Peng 1990, p 46.

*Material examined*

Yunnan: Xishuangbanna, Menglun, 940 m alt., 3♂, 24–26 December 2003, S.-Y. Wen.

*Distribution*

China (Guangdong, Yunnan\*).

***Phortica gamma*** (Toda and Peng)

*Amiota (Phortica) gamma* Toda and Peng 1990, p 45.

*Material examined*

Yunnan: Kuming, Bamboo Temple, 2100 m alt., 2♂, 31 July 2000, J.-J. Gao. Xishuangbanna, Menglun, 700–900 m alt., 3♂, 12 August 2002; 14♂, 22 September 2003, 24–26 December 2003, M. J. Toda, S.-Y. Wen, and H.-W. Chen.

*Distribution*

China (Guangdong, Hainan Is., Yunnan).

***Phortica lambda*** (Toda and Peng)

*Amiota (Phortica) lambda* Toda and Peng 1990, p 50.

*Material examined*

Yunnan: Simao, Yixiang, 1400 m alt., 1♂, 5 July 2000, J.-J. Gao. Xishuangbanna: Bubang-Wangtianshu, 710 m alt., 1♂, 6 November 2001, H. Watabe; 4♂, 11 September 2002 (2♂, *ex tree trunks*), H.-W. Chen; Menglun, 940 m alt, 2♂, 8 March 2003, 18♂, 24–26 December 2003, M. J. Toda, S.-Y. Wen, and H.-W. Chen.

*Distribution*

China (Guangdong, Yunnan\*).

***Phortica pseudopi*** (Toda and Peng)

*Amiota (Phortica) pseudopi* Toda and Peng 1990, p 45.

*Material examined*

Yunnan: Kunming, Bamboo Temple, 2100 m, 1♂, 31 July 2000, J.-J. Gao.

*Distribution*

China (Anhui, Zhejiang, Guangdong, Yunnan\*, Sichuan, Hainan).

***Phortica pseudotau*** (Toda and Peng)

*Amiota (Phortica) pseudotau* Toda and Peng 1990, p 49.

*Material examined*

Yunnan: Kunming, Bamboo Temple, 2100 m, 1♂, 1♀, 31 July 2000, J.-J. Gao. Mt. Jizu, Binchuan, 1900 m, 41♂, 17–18 August 2000, L.-P. He, J.-G. Xiangyu, H. Takamori, H. Watabe, and H.-W. Chen. Lijiang, Ninglang, 2800 m alt, 2♂, 23 July 2001, J.-J. Gao. Simao, Yixiang, 1400 m alt, 1♂, 5 December 2000, J.-J. Gao; 6♂ (4♂ *ex* tree trunks), 15 September 2002, H.-W. Chen.

*Distribution*

China (Guangdong, Yunnan, Sichuan).

***Phortica saeta*** (Zhang and Gan)

*Amiota (Phortica) saeta* Zhang and Gan 1986, p 354.

*Material examined*

Yunnan: Kunming, Bamboo Temple, 2100 m alt., 1♂, 31 July 2000, J.-J. Gao. Lijiang, Ninglang, 2800 m alt., 2♂, 23 July 2001, J.-J. Gao.

*Distribution*

China (Yunnan).

***Phortica tau*** (Toda and Peng)

*Amiota (Phortica) tau* Toda and Peng 1990, p 48.

*Material examined*

Yunnan: Simao, Yixiang, 1400 m alt., 22♂, 5 December 2000, J.-J. Gao.

*Distribution*

China (Anhui, Zhejiang, Fujian, Guangdong, Yunnan\*, Guizhou, Sichuan).

***Phortica uncinata*** Chen and Gao, sp. nov.

(Figure 5)

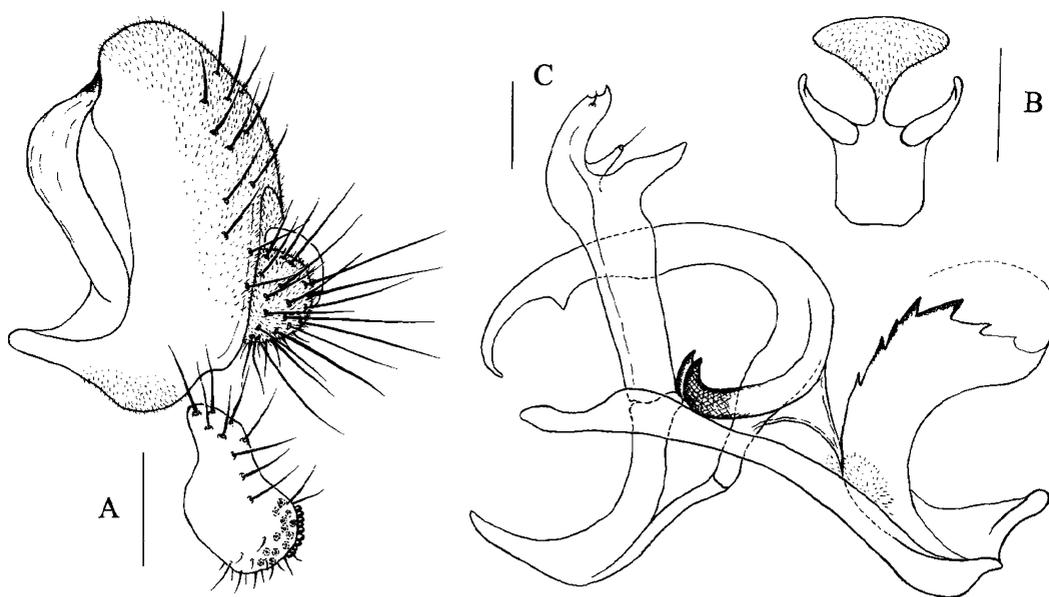


Figure 5. *Phortica uncinata* Chen and Gao, sp. nov., ♂. (A) Epandrium, cercus and surstylus (lateral view); (B) 10th sternite and additional plate (frontal view); (C) hypandrium, gonopod, parameres and aedeagal median rod (lateral view). Scale bars: 0.1 mm.

#### Diagnosis

Aedeagal median rod with one small, triangular process submedially (Figure 5C); branch of aedeagal basal bridge bifurcated apically (Figure 5C); vertical process of gonopod with six to seven sawtooth-shaped processes laterally (Figure 5C).

#### Description

*Head.* Frons dark brown, slightly pale lower, medially with a few minute, interfrontal setulae. Face brown. Gena dark brown. Postgena brown.

*Thorax.* Notum and pleura orange-yellow, with dark brown patches and a pollinose pattern. Anepisternum lacking setulae. Scutellum orange-yellow, pale at tip, with a Y-shaped brownish patch.

*Wing.* r-m and dm-cu crossveins clouded.

*Legs.* Yellow; tibiae with three dark grey rings.

*Abdomen.* First to fifth tergites yellow, second sublaterally and laterally with black patches; third and fifth with medially protruded, broad, brown-black band along posterior margins, sublaterally with one pair of yellow patches; sixth almost entirely black.

*Male terminalia.* Epandrium pubescent anteroventrally and on posterior margins; 11 setae near posterior margin (Figure 5A). Surstylus lacking pubescence, with about ten setae basally, and about seven prenisetae apically. Additional plate between cerci and tenth

sternite with pubescence, connected to tenth sternite (Figure 5B). Hypandrial postero-lateral lobe pubescent (Figure 5C). Paramere lacking pubescence, tripartite distally: apical process with one sensillum, lacking teeth; median process slender, with one sensillum apically; proximal process finger-shaped (Figure 5C).

*Measurements.* BL=3.67 mm (5♂ paratypes: 3.34–3.97); ThL=1.50 mm (1.45–1.50); WL=3.20 mm (3.10–3.50); WW=1.22 mm (1.20–1.40).

*Indices.* arb=6/4 (5–6/3–4), avd=0.60 (0.60–0.70), adf=1.60 (1.60–1.80), flw=1.60 (1.60–1.70), FW/HW=0.40 (0.40), ch/o=0.05 (0.05–0.06), prorrb=1.00 (1.00–1.10), rcorb=0.50 (0.50–0.60), vb=0.50 (0.35–0.50), dcl=0.55 (0.55–0.60), presctl=0.65 (0.60–0.70), sctl=1.20 (1.10–1.20), sterno=0.80 (0.75–0.85), orbito=1.45 (1.40–1.60), dcp=0.25 (0.25), sctlp=1.30 (1.20–1.30), C=2.57 (2.44–2.68), 4c=1.28 (1.17–1.50), 4v=2.69 (2.36–3.14), 5x=1.11 (0.95–1.11), ac=3.70 (3.60–3.90), M=0.69 (0.47–0.70), C3F=0.75 (0.64–0.78).

Holotype: ♂, Yunnan: Xishuangbanna, Menglun, 940 m alt., 13 September 2002, H.-W. Chen (SCAU). Paratypes: Yunnan: Simao, Yixiang, 1400 m alt., 6♂ (3♂, ex tree trunks) same data as the holotype (SCAU); 7♂, 5 December 2000, J.-J. Gao (KIZ). Xishuangbanna, Menglun, 940 m alt., 5♂, 22–23 September 2003, 5♂, 24–26 December 2003, S.-Y. Wen and H.-W. Chen (6♂, SCAU; 4♂, SEHU).

#### *Remarks*

This species resembles *P. pi* (Toda and Peng, 1990) from Guangdong, China in having the branch of the aedeagal basal bridge hook-shaped, strongly sclerotized. It can be distinguished from *P. pi* by having the vertical process of gonopod with six to seven pairs of sawtooth-shaped processes (*P. pi* has only two pairs of horn-shaped processes and the branch of aedeagal basal bridge not bifurcated apically).

#### **Not assigned to any species-complex or group**

##### ***Phortica bipartita*** (Toda and Peng)

*Amiota (Phortica) bipartita* Toda and Peng 1992, p 204.

#### *Material examined*

Yunnan: Xishuangbanna: Mengla, Buban-Wangtianshu, 710 m alt., 1♂, 6 November 2001, H. Watabe; Menglun, 940 m alt., 3♂, 8 March 2003, 2♂, 23 September 2003, 6♂, 24–26 December 2003, M. J. Toda, S.-Y. Wen, and H.-W. Chen.

#### *Distribution*

China (Guangdong, Hainan, Yunnan\*).

##### ***Phortica cardua*** (Okada)

*Amiota (Phortica) cardua* Okada 1977, p 24.

*Material examined*

Yunnan: Kunming, Bamboo Temple, 2100 m alt., 12♂, 31 July 2000, 3♂, 14 August 2000, 1♂, 3 April 2003, J.-J. Gao and H.-W. Chen. Mt. Jizu, Binchuan, 1700–1900 m alt., 11♂ (4♂, *ex* tree trunks), 17–18 August 2000, L.-P. He, J.-G. Xiangyu, H. Takamori, H. Watabe, and H.-W. Chen. Mt. Gaoligong, Pianma, 2600 m alt, 8♂, 13 August 2000 (5♂, *ex* tree trunks), H.-W. Chen. Simao, Yixiang, 1400 m alt, 17♂, 5–6 December 2000, J.-J. Gao. Xishuangbanna: Bubang-Wangtianshu, 1♂, 6 November 2001, H. Watabe; Menglun, 940 m alt., 1♂, 24 December 2003, S.-Y. Wen.

*Distribution*

China (Anhui, Taiwan, Guangdong, Yunnan), Viet Nam.

***Phortica excrescentiosa*** (Toda and Peng)

*Amiota (Phortica) excrescentiosa* Toda and Peng 1990, p 51.

*Specimen examined*

Yunnan: Xishuangbanna, Menglun, 940 m alt., 9♂, 8 March 2003, 6♂, 24–26 December 2003, M. J. Toda, S.-Y. Wen, and H.-W. Chen.

*Distribution*

China (Guangdong, Yunnan).

***Phortica flexuosa*** (Zhang and Gan)

*Amiota (Phortica) flexuosa* Zhang and Gan 1986, p 355.

*Material examined*

Yunnan: Kunming, Bamboo Temple, 2100 m alt., 4♂, 31 July, 4 August 2000, J.-J. Gao and H.-W. Chen. Mt. Jizu, Binchuan, 1800 m alt., 1♂, 17 August 2000, H.-W. Chen.

*Distribution*

China (Taiwan, Anhui, Zhejiang, Jiangxi, Yunnan).

***Phortica hani*** (Zhang and Shi)

*Amiota (Phortica) protrusa* Zhang and Shi 1997, p 371.

*Material examined*

Yunnan: Lijiang, Ninglang, 1800 m alt., 2♂, 25 July 2001, J.-J. Gao.

*Distribution*

China (Yunnan).

***Phortica protrusa*** (Zhang and Shi)

*Amiota (Phortica) protrusa* Zhang and Shi 1997, p 370.

*Material examined*

Yunnan: Mt. Gaoligong, Pianma, 2400 m alt., 54♂ (24♂ ex tree trunks), 11–15 August 2000, L.-P. He, J.-G. Xiangyu, H. Takamori, H. Watabe, and H.-W. Chen. Mt. Ailao, Jingdong, 2450 m alt., 3♂, 22 July 2001, J.-J. Gao.

*Distribution*

China (Yunnan).

***Phortica pseudogigas*** (Zhang and Gan)

*Amiota (Phortica) pseudogigas* Zhang and Gan 1986, p 353.

*Material examined*

Yunnan: Kunming, Bamboo Temple, 2100 m alt., 217♂, 34♀, 31 July, 4 August 2000, J.-J. Gao and H.-W. Chen. Mt. Ailao, Jingdong, 3♂, 25 June 2001, J.-J. Gao; 1♂, 14 June 2003, B.-C. Wang. Mt. Wuliang, Nanjian, 2400 m alt., 1♂, 1 July 2001, J.-J. Gao. Simao, Yixiang, 1400 m alt., 1♂, 5 December 2000, J.-J. Gao.

*Distribution*

China (Sichuan, Yunnan).

***Phortica subradiata*** (Okada)

*Amiota (Phortica) subradiata* Okada 1977, p 24.

*Amiota (Phortica) orientalis*: Okada 1971, p 91 (nec Hendel, 1914, misidentification).

*Material examined*

Yunnan: Simao, 1100 m alt., 1♂, 10 November 2001, H. Watabe. Xishuangbanna: Bubang-Wangtianshu, 4♂, 5 November 2001, L.-P. He and H. Watabe; Menglun, 2♂, 12 August 2002, M. J. Toda; 1♂, 13 September 2002, H.-W. Chen; 7♂, 8 March 2003, 20♂, 12 September 2003, 6♂ (14♂ ex tree trunks), 24–26 December 2003, M. J. Toda, S.-Y. Wen, and H.-W. Chen; Mengyang, 3♂, 9 September 2002, ex tree trunks, H.-W. Chen.

*Distribution*

China (Taiwan, Yunnan\*).

***Phortica glabtabula*** Chen and Gao, sp. nov.  
(Figure 6)

*Diagnosis*

Secondary process of paramere small, with one sensillum subapically (Figure 6C); branch of aedeagal basal bridge sclerotized along outer margin, with about seven acute, marginal projections (Figure 6C).

Some characters commonly seen in *P. uncinata* sp. nov. are not referred to in the following description.

*Description*

*Head.* Frons brown, pale lower. Face, gena and postgena brown.

*Thorax.* Anepisternum lacking setulae.

*Legs.* Yellow except femora mostly brown.

*Abdomen.* Second tergite laterally with brown-black patches; third and fifth with medially protruded and sublaterally interrupted, broad, brown-black bands along posterior margins; sixth nearly entirely black.

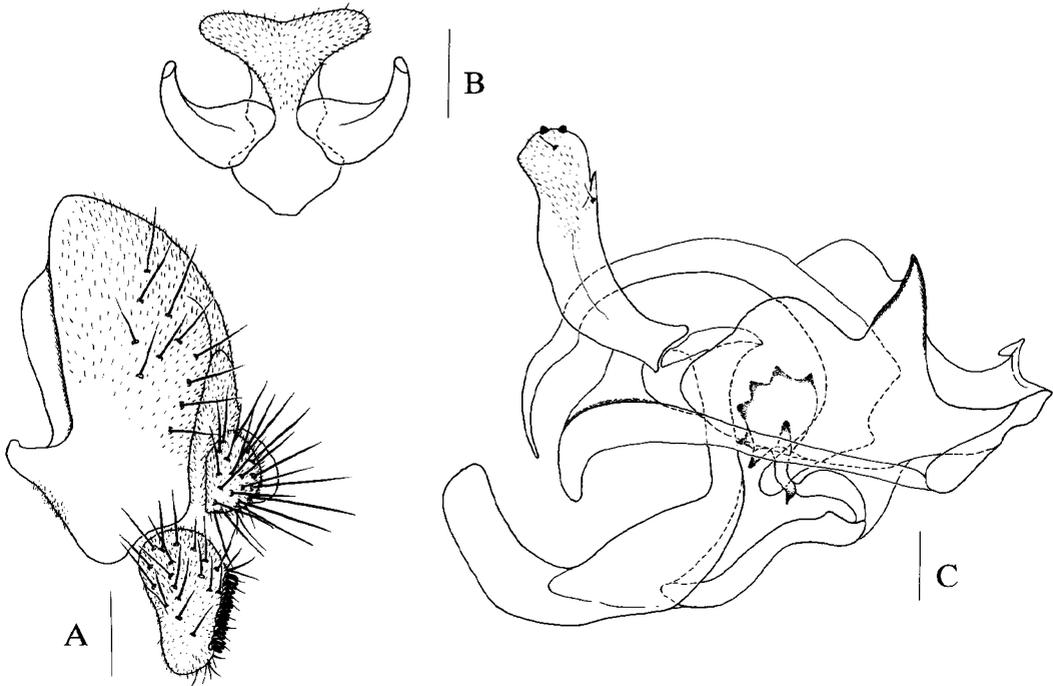


Figure 6. *Phortica glabtabula* Chen and Gao, sp. nov., ♂. (A) Epandrium, cercus and surstylus (lateral view); (B) 10th sternite and additional plate (frontal view); (C) hypandrium, gonopod, parameres and aedeagal median rod (lateral view). Scale bars: 0.1 mm.

*Male terminalia.* Epandrium with pubescence anteroventrally, and 11–12 setae near posterior margin (Figure 6A). Surstylus with pubescence, and dense setae, and about 20 apically round prenisetae (Figure 6A). Vertical process of gonopod very large, narrowed and sclerotized apically (Figure 6C). Paramere distally pubescent, with one sensillum and two teeth apically (Figure 6C). Aedeagal median rod slender (Figure 6C).

*Measurements.* BL=3.30 mm; ThL=1.37 mm; WL=3.00 mm; WW=1.20 mm.

*Indices.* arb=4–5/2–3, avd=0.70, adf=1.30, flw=1.50, FW/HW=0.40, ch/o=0.07, prorb=1.30, rcorb=0.50, vb=0.35, dcl=0.55, presctl=0.80, sctl=1.05, sterno=0.95, orbito=1.50, dcp=0.35, sctlp=1.10, C=2.00, 4c=1.67, 4v=2.94, 5x=0.92, ac=3.33, M=0.72, C3F=0.78.

Holotype: ♂, Yunnan: Simao, Yixiang, 1400 m alt. 5 December 2000, J.-J. Gao (KIZ).

#### *Remarks*

This species resembles *P. cardua* in having the anepisternum lacking setulae, and the shape of the paramere and gonopod, but can be distinguished from the latter species by the arista and the vertical processes of the gonopod (*P. cardua* has only one short ventral branch in the arista; vertical process of gonopod depressed and unsclerotized medially).

### ***Phortica latipenis* Chen and Gao, sp. nov.**

(Figure 7)

#### *Diagnosis*

Secondary process of paramere larger than primary process, with a spine-shaped projection apically (Figure 7C); branch of aedeagal basal bridge strong, tripartite (Figure 7C).

Some characters commonly seen in *P. uncinata* sp. nov. are not referred to in the following description.

#### *Description*

*Head.* Frons brown. Arista basally with dorsal branches. Face brown. Gena black. Postgena brown.

*Thorax.* Pleura nearly entirely black. Anepisternum with several setulae.

*Legs.* Mid tibia subapically with two longer setae on anterior surface.

*Abdomen.* Abdominal third and fifth tergites with medially and sublaterally interrupted, broad, brown-black bands along posterior margins.

*Male terminalia.* Epandrium lacking pubescence anteroventrally, with eight setae near dorsal to posterior margins (Figure 7A). Surstylus with pubescence and dense setae, and about 15–17 apically round prenisetae (Figure 7A). Vertical process of gonopod slightly

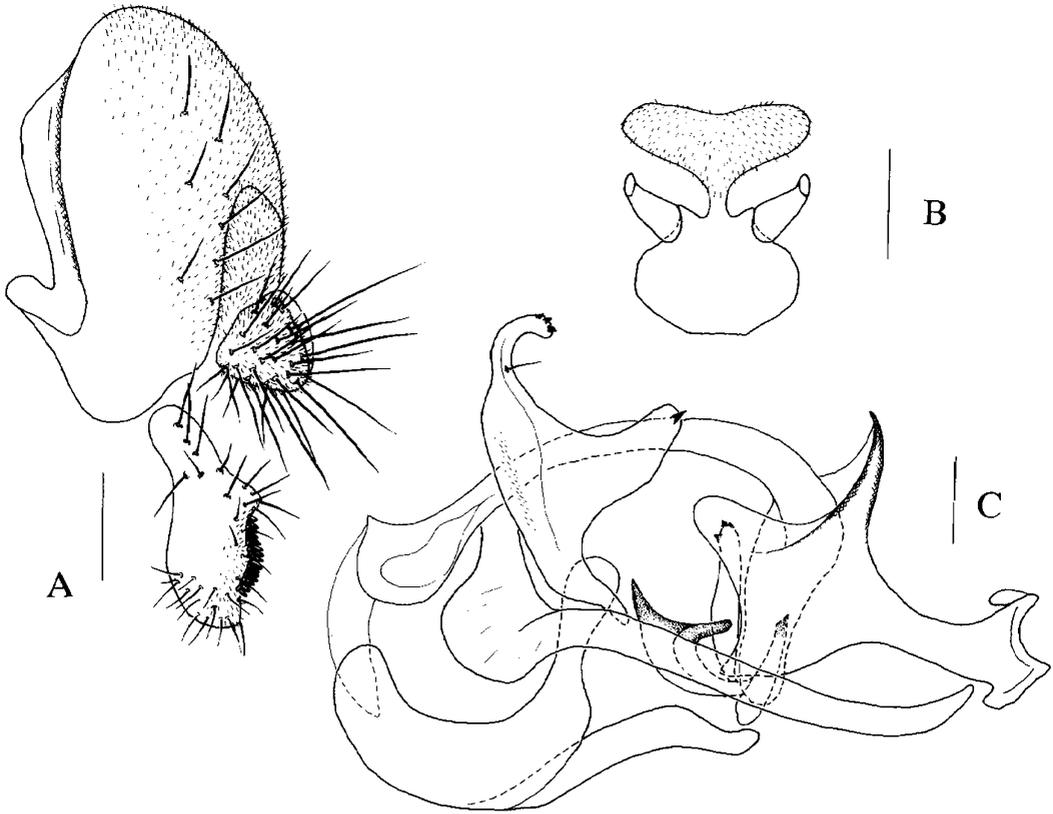


Figure 7. *Phortica latipenis* Chen and Gao, sp. nov., ♂. (A) Epandrium, cercus and surstylus (lateral view); (B) 10th sternite and additional plate (frontal view); (C) hypandrium, gonopod, parameres and aedeagal median rod (lateral view). Scale bars: 0.1 mm.

narrowed and sclerotized apically (Figure 7C). Paramere submedially pubescent and much expanded, with two processes apically: primary process with one sensillum and three small teeth apically (Figure 7C); aedeagal median rod asymmetrically expanded subapically (Figure 7C).

*Measurements.* BL=3.00 mm; ThL=1.25 mm; WL=2.70 mm; WW=1.25 mm.

*Indices.* arb=3/0, adf=1.80, flw=1.50, FW/HW=0.40, ch/o=0.07, prorb=1.00, rcorb=0.40, vb=0.40, dcl=0.55, presctl=0.70, sctl=1.10, sterno=0.90, orbito=1.70, dcp=0.30, sctlp=1.10, C=2.40, 4c=1.47, 4v=3.06, 5x=0.79, ac=2.78, M=0.82, C3F=0.79.

*Holotype:* ♂, Yunnan: Simao, Yixiang, 1400 m alt., 5 December 2000, J.-J. Gao (KIZ).

#### *Remarks*

This species is similar to *P. eparmata* (Okada, 1977) from Taiwan in the shape of the aedeagal median rod, and having the anepisternum with setulae, but can be

distinguished from the latter species by the arista and the shape of the paramere (in *P. eparmata*: arista with five dorsal and one ventral branches, and paramere deeply concaved submedially).

***Phortica setitabula*** Chen and Gao, sp. nov.  
(Figure 8)

*Diagnosis*

Additional plate between cerci very large, more than tenth sternite (Figure 8B); paramere subapically with acute process (Figure 8C); branch of aedeagal basal bridge with two slender processes basally and two small, triangular projections laterally (Figure 8C).

Some characters commonly seen in *P. uncinata* sp. nov. are not referred to in the following description.

*Description*

*Head.* Frons nearly entirely dark brown. Arista basally with dorsal branches. Face entirely orange-brown. Gena black. Postgena brown.

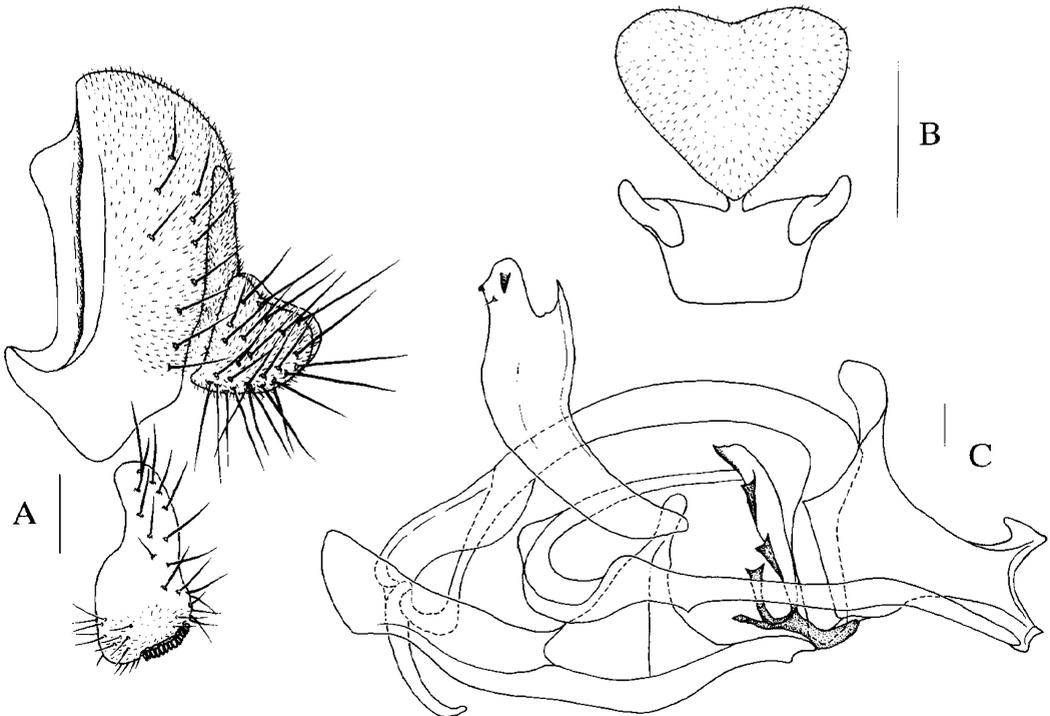


Figure 8. *Phortica setitabula* Chen and Gao, sp. nov., ♂. (A) Epandrium, cercus and surstylus (lateral view); (B) 10th sternite and additional plate (frontal view); (C) hypandrium, gonopod, parameres and aedeagal median rod (lateral view). Scale bars: 0.1 mm.

*Thorax.* Anepisternum with a few setulae. Scutellum pale yellow, with a grey patch.

*Legs.* Mid tibia subapically with two to three longer setae on anterior surface.

*Abdomen.* Third and fifth tergites with broad, brown-black bands along posterior margins, sublaterally with one pair of yellow patches.

*Male terminalia.* Epandrium lacking pubescence anteroventrally, with ten setae near the dorsal to posterior margins (Figure 8A). Surstylus with dense, long setae, and pubescence, and about 18–20 apically rounded prensisetae (Figure 8A). Paramere lacking pubescence, with one sensillum and two pointed teeth apically (Figure 8C). Aedeagal median rod symmetrically expanded subapically (Figure 8C).

*Measurements.* BL=4.20 mm (3♂ paratypes: 3.34–4.40); ThL=1.75 mm (1.40–2.10); WL=3.80 mm (3.27–4.10); WW=1.50 mm (1.33–1.80).

*Indices.* arb=5/0, adf=1.60 (1.40–1.60), flw=1.60 (1.50–1.60), FW/HW=0.40 (0.40), ch/o=0.07 (0.07–0.08), prorrb=1.20 (1.00–1.20), rcorb=0.45 (0.40–0.50), vb=0.35 (0.35–0.50), dcl=0.50 (0.50–0.55), presctl=0.75 (0.65–0.80), sctl=1.10 (1.00–1.10), sterno=0.95 (0.90–0.95), orbito=1.60 (1.30–1.60), dcp=0.25 (0.25–0.30), sctlp=1.10 (1.10), C=2.40 (2.50–2.81), 4c=1.59 (1.30–1.60), 4v=3.14 (2.86–3.70), 5x=1.00 (0.71–0.80), ac=3.50 (2.60–3.00), M=0.68 (0.60–0.70), C3F=0.76 (0.69–0.71).

Holotype: ♂, China: Yixiang, Simao, Yunnan, 1400 m alt., 5 December 2000, J.-J. Gao (KIZ). Paratypes: 3♂, same data as the holotype (KIZ, SCAU, and SEHU).

#### Remarks

This species is similar to *P. bipartita* (Toda and Peng, 1992) in the anepisternum with setulae and the aedeagal median rod much expanded apically. In *P. bipartita* the arista has three ventral branches, and the paramere is strongly sclerotized and deeply bifurcated: the primary one with two sharp projections apically and three to four sensilla subapically; secondary one slender.

#### ***Phortica unipetala* Chen and Wen, sp. nov.** (Figure 9)

#### Diagnosis

Paramere submedially with small, triangular process, and secondary process slender with one tooth apically (Figure 9C); branch of aedeagal basal bridge large, single, strongly sclerotized (Figure 9C).

Some characters commonly seen in *P. uncinata* sp. nov. are not referred to in the following description.

#### Description

*Head.* Frons, face, gena, and postgena brown.

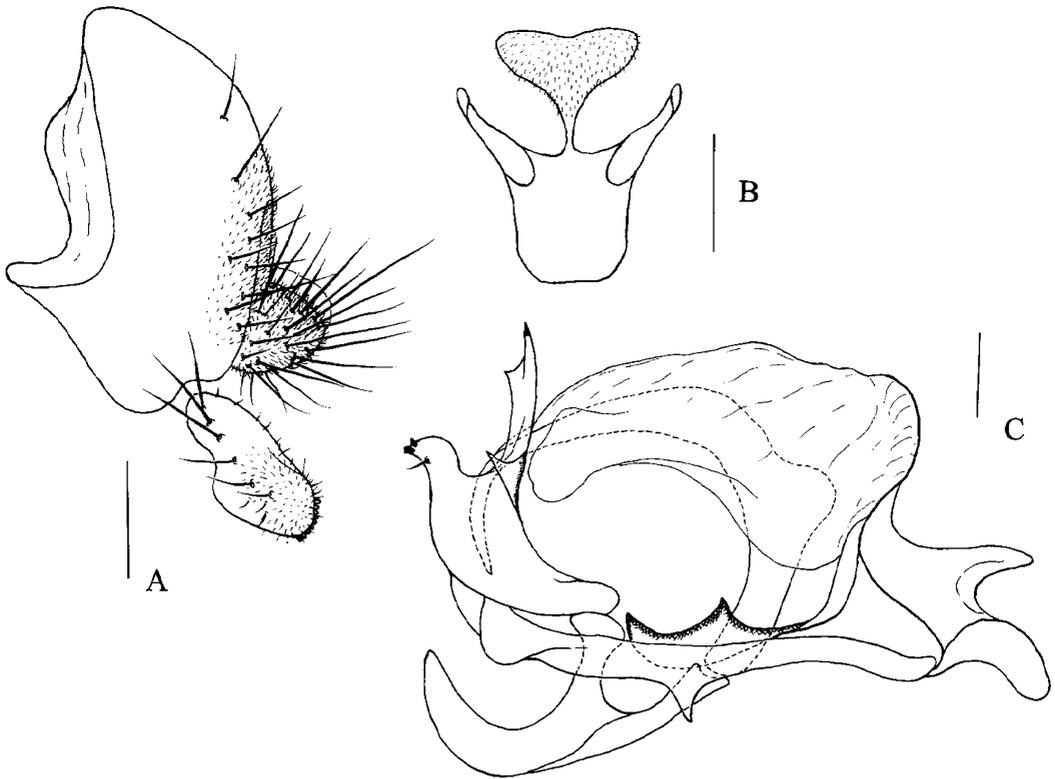


Figure 9. *Phortica unipetala* Chen and Wen, sp. nov., ♂. (A) Epandrium, cercus and surstylus (lateral view); (B) 10th sternite and additional plate (frontal view); (C) hypandrium, gonopod, parameres and aedeagal median rod (lateral view). Scale bars: 0.1 mm.

*Thorax.* Anepisternum with a few setulae.

*Legs.* Mid tibia subapically with three to four longer setae on anterior surface.

*Abdomen.* Abdominal third and fifth tergites with medially interrupted, broad, brown-black bands along the posterior margin, sublaterally with one pair of yellow patches.

*Male terminalia.* Epandrium pubescent near posterior margin, with nine setae near dorsal to posterior margins (Figure 9A). Surstylus with about six long setae on basal two-thirds, pubescence on distal half part, and about ten prenisetae along apical margin (Figure 9A). Paramere lacking pubescence, primary process with one sensillum and two small teeth (Figure 9C). Aedeagal median rod expanded subapically, asymmetrical (Figure 9C).

*Measurements.* BL=3.80 mm (1♂ paratype: 3.74); ThL=1.50 mm (1.50); WL=3.40 mm (3.50); WW=1.26 mm (1.30).

*Indices.* arb=6/3 (6/3), avd=0.80 (0.75), adf=1.60 (1.70), flw=1.20 (1.30), FW/HW=0.40 (0.40), ch/o=0.06 (0.06), prorb=1.00, rcorb=0.35 (0.40), vb=0.40 (0.35), dcl=0.55 (0.55), presctl=0.70 (0.80), sctl=1.20 (1.10), sterno=0.75 (0.70), orbito=1.80

(1.70),  $dcp=0.30$  (0.30),  $sctlp=1.30$  (1.20),  $C=2.25$  (2.50),  $4c=1.43$  (1.10),  $4v=2.92$  (2.83),  $5x=1.00$  (1.29),  $ac=3.33$  (3.30),  $M=0.57$  (0.77),  $C3F=0.68$  (0.71).

Holotype: ♂, Yunnan: Menglun, Xishuangbanna, 940 m alt., 23 September 2003, H.-W. Chen (SCAU). Paratype: 1♂, same data as the holotype (SCAU).

#### Remarks

This species is similar to *P. bipartita* in having the anepisternum with setulae and the arista with dorsal and ventral branches. In *P. bipartita* the paramere is deeply bifurcated: the primary one with two sharp projections apically and three to four sensilla subapically; secondary one slender.

#### *Phortica pangi* Chen and Wen, sp. nov.

(Figure 10)

#### Diagnosis

Paramere apically with one sensillum, two small teeth and a small triangular, lobe-shaped process (Figure 10C); branch of aedeagal basal bridge large quadripartite, strongly sclerotized (Figure 10C).

Some characters commonly seen in *P. uncinata* sp. nov. are not referred to in the following description.

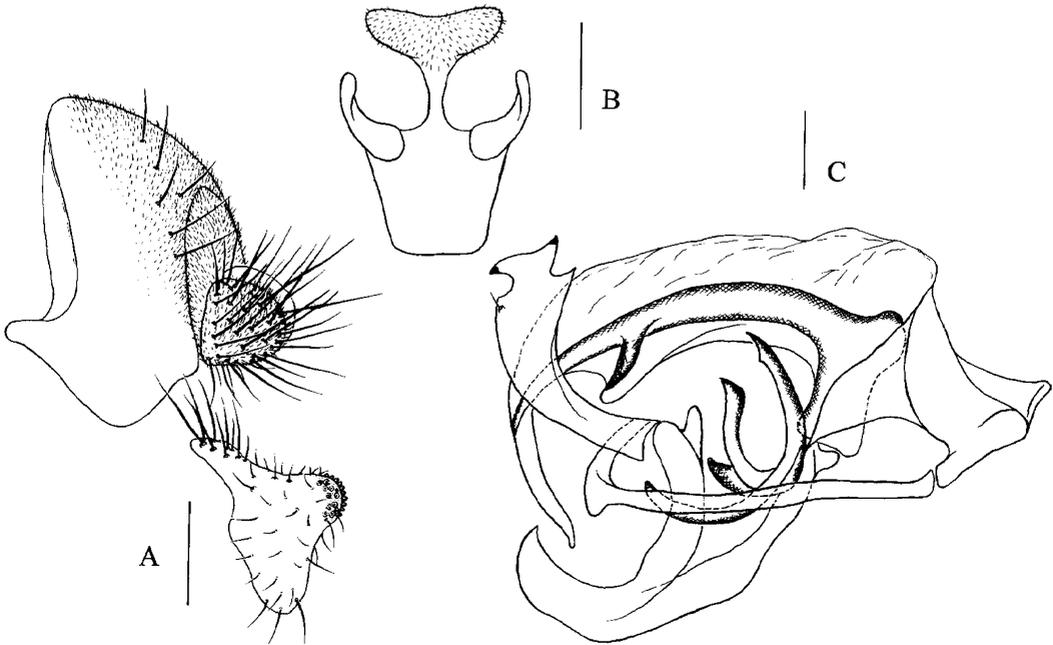


Figure 10. *Phortica pangi* Chen and Wen, sp. nov., ♂. (A) Epandrium, cercus and surstylus (lateral view); (B) 10th sternite and additional plate (frontal view); (C) hypandrium, gonopod, parameres and aedeagal median rod (lateral view). Scale bars: 0.1 mm.

*Description*

*Head.* Frons dark brown. Face brown. Gena dark brown. Postgena brown.

*Thorax.* Anepisternum with a few setulae.

*Legs.* Mid tibia subapically with three to four longer setae on anterior surface.

*Abdomen.* Abdominal third and fifth tergites with medially and laterally interrupted, broad, brown bands along posterior margins.

*Male terminalia.* Epandrium pubescent, with six setae near dorsal and posterior margins (Figure 10A). Surstylus with about six to eight long setae on basal one-third, and a few short setae on distal two-thirds, and about ten prenisetae along inner margin (Figure 10A). Paramere lacking pubescence (Figure 10C). Aedeagal median rod subapically expanded, symmetrical, with one pair of processes (Figure 10C).

*Measurements.* BL=3.50 mm (3♂ paratypes: 3.34–3.60); ThL=1.10 mm (1.05–1.20); WL=2.83 mm (2.67–3.10); WW=1.10 mm (1.05–1.10).

*Indices.* arb=5/2–3 (5/2–3), avd=0.65 (0.50–0.70), adf=2.00 (1.80–2.00), flw=1.40 (1.40–1.50), FW/HW=0.40 (0.40), ch/o=0.06 (0.06), prorb=1.00 (1.00–1.10), rcorb=0.45 (0.45–0.50), vb=0.50 (0.35–0.50), dcl=0.55 (0.55–0.60), presctl=0.70 (0.70–0.80), sctl=1.10 (1.10–1.20), sterno=0.80 (0.75–0.80), orbito=1.40 (1.50–1.60), dcp=0.30 (0.30), sctlp=1.20 (1.10–1.20), C=2.10 (2.00–2.30), 4c=1.52 (1.56–1.85), 4v=2.80 (2.86–3.55), 5x=1.05 (1.00–1.11), ac=3.80 (3.70–3.90), M=0.80 (0.49–0.70), C3F=0.70 (0.67–0.73).

Holotype: ♂, Yunnan: Menglun, Xishuangbanna, 940 m alt., 21 September 2003, H.-W. Chen (SCAU). Paratypes: 1♂, data as holotype (SCAU); 2♂, 24–26 December 2003, S.-Y. Wen (KIZ and SEHU). Hainan: Ledong, Jianfengling, alt. 780 m, 2♂, 19 May 2004, H.-W. Chen leg. (SCAU).

*Remarks*

This species is similar to *P. setitabula* sp. nov. in the paramere lacking pubescence and the aedeagal median rod subapically symmetrical. In *P. setitabula* the arista is without ventral branches; additional plate between cerci very large, more than tenth sternite.

Key to all species examined of the genus *Phortica* from Yunnan, China

*Male*

- 0 Ocellar tubercle with additional pair of small setae below ocellars; proclinate orbital seta nearer to inner vertical seta than to ptilinal fissure; palpus with hollow sense organ; aedeagal apodeme laterally flattened (genus *Phortica*) . . . . . 1

1. Interfrontal setae thick, and dense; male arista usually swollen apically; all tibiae lacking dark rings; tenth sternite absent; paramere short rod-shaped, apically knobbed, basally with any sensilla (*foliiseta* species-complex) . . . . . 2
- Interfrontal setae thin and sparse; arista not swollen apically; tibiae with dark rings; tenth sternite present; paramere with sensilla apically . . . . . 5
2. Surstylus with prensisetae; aedeagal outer membrane with numerous, little, triangular spinules . . . . . *longipenis* Chen and Gao, sp. n.
- Surstylus without prensisetae; aedeagal outer membrane lacking spine-like ones . . . . . 3
3. Arista basally with two dorsal branches; vertical process of gonopod apically with only one projection . . . . . *speculum* (Máca and Lin)
- Arista basally without distinct dorsal branches; vertical process of gonopod apically with two projections . . . . . 4
4. Arista apically arrow-shaped; right lateral lobe of vertical process of gonopod with two pointed projections; paramere slightly curved distally . . . . .
- . . . . . *sagittaristula* Chen and Wen, sp. nov.
- Arista tip broadened, broader than its two-thirds length; right lateral lobe of vertical process of gonopod with one pointed projection; paramere strongly curved distally . . . . . *saltiaristula* Chen and Wen, sp. nov.
5. Paramere deeply bifurcated from base (*omega* species-complex) . . . . . 6
- Paramere branched distally or submedially. . . . . 7
6. Sixth tergite with two prickly processes on lateral margins . . . . .
- . . . . . *biprotrusa* (Chen and Toda)
- Sixth tergite only one prickly process and dense long setae each at anterior and posterior corners of lateral margins . . . . . *omega* (Okada)
7. Surstylus with black, long, thick spine-like prensisetae on apical margin . . . . . 8
- Surstylus without long and thick spine-like prensisetae on apical margin . . . . . 9
8. Surstylus with three long and three short spine-like prensisetae . . . . . *pseudogigas* (Zhang and Gan)
- . . . . . *magna* species-complex)
- Surstylus with only one spine-like prensisetae (*magna* species-complex) . . . . . *bicornuta* (Chen and Toda)
9. Arista only with four to six minute, dorsal branches; cercus apically with two to three setae much longer than the length of cercus . . . . . *hani* (Zhand and Shi)
- Arista with long dorsal branches; cercus apically without long seta . . . . . 10
10. Anepisternum with setulae . . . . . 11
- Anepisternum lacking setula . . . . . 15
11. Paramere submedially pubescent; vertical process of gonopod slightly narrowed and sclerotized apically . . . . . *latipenis* Chen and Gao, sp. nov.
- Paramere lacking pubescence; vertical process of gonopod not narrowed and unsclerotized . . . . . 12
12. Paramere with slender secondary process . . . . . 13
- Paramere without slender secondary process . . . . . 14

13. Paramere: thick process apically with two sharp projections, subapically with about three sensilla; thin process without tooth; branch of aedeagal basal bridge with two dendric arms apically bifid. . . . . *bipartite* (Toda and Peng)  
 – Paramere: thick process with one sensillum and two small teeth; thin process with one tooth apically; branch of aedeagal basal bridge large, single . . . . .  
 . . . . . *unipetala* Chen and Wen, sp. nov.
14. Paramere subapically with one acute process; aedeagal median rod without processes . . . . . *setitabula* Chen and Wen, sp. nov.  
 – Paramere apically with small triangle, lobe-shaped process; aedeagal median rod subapically with one pair of processes . . . . . *pangi* Chen and Wen, sp. nov.
15. Sixth tergite constricted at anterior corner of lateral margins . . . . . 16  
 – Sixth tergite not constricted at anterior corner of lateral margins . . . . . 17
16. Arista with only one, very short ventral branch; vertical process of gonopod not narrowed and unsclerotized apically. . . . . *cardua* (Okada)  
 – Arista with two to three ventral branches; vertical process of gonopod narrowed and sclerotized apically . . . . . *glabtabula* Chen and Gao, sp. nov.
17. Paramere tripartite distally (*variegata* species-complex) . . . . . 18  
 – Paramere not tripartite distally . . . . . 26
18. Median process of paramere tongue- or finger-shaped; basal process apically with tooth and sensillum . . . . . 19  
 – Median process of paramere apically with tooth and sensillum; basal process tongue- or finger-shaped . . . . . 23
19. Aedeagal median rod strongly sclerotized, black; vertical process of gonopod sclerotized on lateral margins, basally with one pair of pointed processes . . . . .  
 . . . . . *lambda* (Toda and Peng)  
 – Aedeagal median rod and vertical process of gonopod slightly sclerotized, not black. . . . . 20
20. Aedeagal outer membrane lacking transparent, minute spinules; subbasal processes of aedeagal median rod fused to each other to one triangle . . . . .  
 . . . . . *saeta* (Zhang and Gan)  
 – Aedeagal outer membrane with transparent, minute spinules; subbasal processes of aedeagal median rod separated from each other . . . . . 21
21. Aedeagal median rod submedially with pair of distinct long, lobe-shaped projections . . . . . *acongruens* (Zhang and Shi)  
 – Aedeagal median rod distally without distinct long, lobe-shaped projection . . . . . 22
22. Aedeagal median rod submedially with two different-size projections . . . . .  
 . . . . . *gamma* (Toda and Peng)  
 – Aedeagal median rod submedially with two same-size projections . . . . .  
 . . . . . *eugamma* (Toda and Peng)
23. Additional bridge between aedeagus and gonopod with one pair of sclerotized processes . . . . . 24  
 – Additional bridge between aedeagus and gonopod with two pairs of sclerotized processes . . . . . 25

24. Vertical process of gonopod with six to seven pairs of sawtooth-shaped processes . . . . . *uncinata* Chen and Gao, sp. nov.  
 – Vertical process of gonopod with two pairs of strongly sclerotized horn-like processes apically and basally; apical process small; basal very long . . . . .  
 . . . . . *pseudopi* (Toda and Peng)
25. Process of additional bridge between aedeagus and gonopod not strongly sclerotized; ventral with small triangular warts and fine wrinkles on surface . . . . .  
 . . . . . *tau* (Toda and Peng)  
 – Process of additional bridge between aedeagus and gonopod strongly sclerotized, without small triangular warts and fine wrinkles on surface . . . . .  
 . . . . . *pseudotau* (Toda and Peng)
26. Vertical process of gonopod very narrow, basally to submedially rod-like; aedeagal median rod constricted at basal one-third . . . . . *subradiata* (Okada)  
 – Vertical process of gonopod broad, lobe-like; aedeagal median rod nearly continuous throughout length . . . . . 27
27. Arista without distinct ventral branch; sixth tergite with one spine-shaped process on anterior corner of lateral margins . . . . . *protrusa* (Zhang and Shi)  
 – Arista with distinct ventral branch; sixth tergite lacking process on anterior corner of lateral margins . . . . . 28
28. Mid tibia subapically lacking special longer erect setae on anterior surface; aedeagal outer membrane with transparent, minute sawtooth-shaped processes; additional bridge between aedeagus and gonopod unsclerotized . . . . .  
 . . . . . *flexuosa* (Zhang and Gan)  
 – Mid tibia subapically with two to four longer erect setae on anterior surface; aedeagal outer membrane lacking processes; additional bridge between aedeagus and gonopod sclerotized rod-like . . . . . *excrescentiosa* (Toda and Peng)

### Acknowledgements

We would like to thank Dr. J.-G. Xiangyu, Dr. L.-P. He, Mr. B.-C. Wang (KIZ), Prof. H. Watabe (Hokkaido University of Education, Japan), Prof. M. J. Toda (Hokkaido University, Japan), Dr. Takamori (Tokyo Gakugei University, Japan), for presenting us with invaluable specimens. We also wish to thank Dr. T. Aotsuka (Department of Biology, Tokyo Metropolitan University) and Dr. Y. P. Zhang (KIZ) for sustaining fieldwork. This work was supported by the Japan Society for the Promotion of Science (no. 12375002), National Natural Science Foundation of China (no. 30470212), CAS (no. KSCX2-1-05), Natural Science Foundation of Yunnan University (no. 2003Q013B), and President Science Foundation of SCAU (no. 4200-K03209).

### References

- Chen H-W, Toda MJ. 1997. *Amiota* (*Phortica*) *magna* species-complex, with descriptions of three new species from China (Diptera, Drosophilidae). Japanese Journal of Entomology 65:784–792.
- Chen H-W, Toda MJ. 1998. *Amiota* (*Phortica*) *omega* species-complex, with descriptions of two new species from southern China (Diptera, Drosophilidae). Entomological Science 1:403–407.
- Duda O. 1923. Die orientalischen und australischen Drosophiliden-Arten (Dipteren) des Ungarischen National Museums zu Budapest. Annales Historico-Naturales Musei Nationalis Hungarici 20:24–59.

- Kamakura K, Kamakura S, Tamura S, Shiomi C, Nobukiyo A, Furukawa T. 1998. Incidence of parasitosis associated with oriental eye worm (*Thelazia callipaeda*) in dogs and cats in Hiroshima Prefecture. The Hiroshima Journal of Veterinary Medicine 13:63–68. (Jpn).
- Li DZ, Xue JR. 1977. The biodiversity and conservation of bamboos in Yunnan, China. In: Chapman GP, editor. The bamboos. London: The Linnean Society of London, Academic Press. p 83–94.
- Máca J. 1977. Revision of Palaearctic species of *Amiota* subgenus *Phortica* (Diptera, Drosophilidae). Acta Entomologica Bohemoslovaca 74:115–130.
- Máca J. 2003. Taxonomic notes on the genera previously classified in the genus *Amiota* Loew (Diptera, Drosophilidae, Steganinae). Acta Universitatis Carolinae Biologica 47:247–274.
- Máca J, Lin FJ. 1993. The Drosophilidae of Taiwan: genera *Amiota* subgenus *Phortica*. Bulletin of the Institute of Zoology, Academia Sinica 32:171–183.
- Okada T. 1971. A revision and taxometric analysis of the genus *Amiota* Loew of Japan and adjacent countries (Diptera, Drosophilidae). Kontyû, Tokyo 39:82–98.
- Okada T. 1977. The subgenus *Phortica* Schiner of the genus *Amiota* Loew of Japan and the Oriental Region, with reference to anti-Burlya's rule (Diptera, Drosophilidae). Bulletin of the Biogeographical Society of Japan 32:17–31.
- Schiner IR. 1862. Vorläufiger Commentar zum dipterologischen Theile der "Fauna Austriaca". Wiener Entomologische Monatschrift 6:428–436.
- Toda MJ, Peng TX. 1990. Eight new species of the subgenus *Phortica* (Diptera: Drosophilidae, *Amiota*) from Guangdong Province, southern China. Entomotaxonomia 12:41–55.
- Toda MJ, Peng TX. 1992. Some species of the subfamily Steganinae (Diptera, Drosophilidae) from Guangdong Province, southern China. Annales de la Société Entomologique de France (N.S.) 28:201–213.
- Tsacas L, Okada T. 1983. On the Oriental and New Guinean species of the genus *Amiota* Loew originally described by Duda as *Phortica foliiseta*, with descriptions of three new species (Diptera, Drosophilidae). Kontyû 51:228–237.
- Wang ZX, Du JS, Yang ZZ, Han YP, Jiang BL. 1998. Studies on epidemiologic factor of *Thelazia callipaeda* in China. Chinese Journal of Zoonoses 4:30–32. (Chi).
- Wheeler MR. 1952. The Drosophilidae of the Nearctic Region, exclusive of the genus *Drosophila*. The University of Texas Publication 5204:162–218.
- Zhang WX, Chen HZ, Peng TX. 1996. The family Drosophilidae. In: Xue WQ, Chao CM, editors. Flies of China. Shenyang (China): Liaoning Science and Technology Press. p 280–414. (Chi).
- Zhang WX, Gan YX. 1986. Description of eight new species of drosophilid flies from Kunming (Diptera, Drosophilidae). Zoological Research 7:351–365. (Chi).
- Zhang WX, Shi LM. 1997. Subgenus *Phortica* of genus *Amiota* in Hengduan mountains region, China, with descriptions of three new species (Diptera: Drosophilidae). Zoological Research 18:367–375. (Chi).