Four new species of the genus *Apsiphortica* Okada, 1971 (Diptera, Drosophilidae), with supplementary descriptions of two known species

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(Accepted 6 June 2007)

Abstract

Four new species of the genus *Apsiphortica* Okada, 1971 are described: *A. longiciliata* Cao and Chen, *A. melanogaster* Chen, and *A. xui* Chen, spp. nov. from southwest China, and *A. multiclavata* Chen and Toda, sp. nov. from Sabah in Malaysia. Supplementary descriptions are provided for two known species, *A. holubi* Máca, 2003 and *A. lini* (Okada, 1971), after examination of the holotype specimens. A key to all the species of the genus *Apsiphortica* is provided.

Keywords: Holotype, key, Malaysia, Sabah, southwest China, Steganinae, taxonomy

Introduction

*Apsiphortica* Okada, 1971 was established originally as a subgenus of *Amiota* Loew, 1862. Máca (2003) recently revised the classification of subgenera formerly assigned to *Amiota* s. lat. and raised *Apsiphortica* and *Phortica* Schiner, 1862 to generic rank. These two genera resemble each other in having the aedeagus composed of the more or less sclerotized median rod and the outer membrane, and further an important character, the anepisternum bearing setulae, designated as diagnostic for *Apsiphortica* by Okada (1971) and Máca (2003) is shared with six *Phortica* (s. str.) species: *P. bipartita* (Toda and Peng, 1992), *P. eparmata* (Okada, 1977), *P. latipenis* Chen and Gao, 2005, *P. pangi* Chen and Wen, 2005, *P. setitabula* Chen and Gao, 2005, and *P. unipetala* Chen and Wen, 2005. On the other hand, *Apsiphortica* resembles also the genus *Stegana* Meigen, 1830 in sharing some (plesiomorphic) characters, for example, the long rod-like aedeagal apodeme and the plate-like hypandrium. To date, only two species are known in the genus *Apsiphortica*: *A. lini* (Okada, 1971) from Taiwan and *A. holubi* Máca, 2003 from Zimbabwe. This paper adds four new species from southwest China and Malaysia to this genus and provides supplementary descriptions for the two known species and a key to all species of this genus. The morphological terminology and the definition of indices follow Chen and Toda (2001) and Chen and Aotsuka (2003).
The type specimens are deposited in the following institutions: Kunming Institute of Zoology, Chinese Academy of Sciences, Kunming, China (KIZ); Kinabalu Park, Sabah Parks, Sabah, Malaysia (KPSP); National Science Museum, Tokyo, Japan (NSMT); Department of Entomology, South China Agricultural University, Guangzhou, China (SCAU); Systematic Entomology, the Hokkaido University Museum, Hokkaido University, Sapporo, Japan (SEHU); Zoological Museum of the University of Zürich, Zürich, Switzerland (ZMZ).

_Apsiphortica_ Okada

_Amiota (Apsiphortica) Okada 1971, p 90. Type species: _Amiota (Apsiphortica) lini_ Okada, 1971._

_Apsiphortica_: Máca 2003, p 249 (revised status).

**Diagnosis (modified from Máca 2003)**

Interfrontal setae thick; anepisternum with several setulae; paramere lacking sensilla (Figures 3, 6, 7, 11, 12, 14); aedeagal median rod with dorsal process(es) or projection(s) subbasally (Figures 3, 6, 7, 11, 12); aedeagal outer membrane with sclerotized pieces (Figures 3, 6, 7, 11, 12, 14). These characters are not autapomorphies for this genus, but shared (some as plesiomorphies) with other steganine taxa as mentioned above. However, these characters in combination clearly distinguish this genus from any other genera.

_Apsiphortica holubi_ Máca

_Apsiphortica holubi_ Máca 2003, p 249.

**Diagnosis**

Aedeagal median rod apically dilated roundly in ventral view; aedeagal outer membrane with two small sclerotized pieces (neither described nor illustrated by Máca 2003).

**Specimen examined**

Zimbabwe: holotype ♂, Zambezi river, SE Angwa Bridge, 16°08’S, 30°15’E, September 1988, J. Weyrich leg. (ZMZ).

**Distribution**

Zimbabwe.

**Remarks**

Máca (2003) misjudged the small dorsal projection of the aedeagal median rod as the paramere and illustrated these organs as being fused, but the parameres are separated from the dorsal projection of aedeagal median rod.

_Apsiphortica lini_ (Okada)

(Figures 1–3)

_Amiota (Apsiphortica) lini_ Okada 1971, p 90.
Diagnosis

Aedeagal median rod apically neither dilated nor bifurcated in ventral view (Figure 3); paramere apically slightly expanded triangularly (Figure 3).

Description

Supplementary to Okada (1971).

Male terminalia. Tenth sternite laterally fused to surstyli, with small glabrous or non-pubescent median piece and a pair of elongated lateral arms apically contiguous to base of gonopod (Figures 2, 3). Hypandrium plate-like anteromedially (Figure 3). Parameres basally articulated with aedeagal apodeme (Figure 3). Gonopod apically broadened (Figure 3). Aedeagal outer membrane with numerous sclerotized small pieces (Figure 3; the aedeagal outer membrane was not illustrated by Okada 1971, and is missing from the dissected male terminalia of holotype). Aedeagal median rod curved dorsad, subbasally with strong dorsal process, basally articulated with aedeagal apodeme (Figure 3). Aedeagal apodeme long rod-like (Figure 3); ventral branches of aedeagal apodeme apically fused to each other (Figure 3).
Specimens examined

Holotype: ♂, China: Puli, Nantou, Taiwan, 19 August 1967, T. Okada leg. (NSMT); 1 ♂, Chitou, Taiwan, 21 April 1997, M. J. Toda leg. (SEHU); 2 ♂, Wuyishan, Fujian, and Jiangxi, 27°43′N, 117°57′ E, altitude 1400 m, 14–16 June 2004, ex human eyes, J.-J. Gao and H.-W. Chen leg. (SCAU).

Distribution

China (Fujian, Taiwan, Jiangxi).

*Apsiphortica longiciliata* Cao and Chen, sp. nov.

(Figures 4–6)

Diagnosis

Aedeagal median rod dorsosubapically with small triangular projection in addition to prominent subbasal dorsal projection, apically hook-like bifurcated (Figure 6).

Description

Head. Eye brown-red. Ocellar triangle dark brown. Postocellar setae longer than interfrontal setae, slightly behind top of vertex ridge. Frons, face, and gena all brown. Pedicel

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Figures 4–6. *Apsiphortica longiciliata* Cao and Chen, sp. nov., ♂. (4) Epandrium, cercus, and surstylus, lateral view. (5) Surstylus and 10th sternite, ventral view. (6) Hypandrium, gonopod, paramere, aedeagal median rod, and aedeagal apodeme, lateral view. For abbreviations see Figures 1–3. Scale bars: 0.1 mm.
brown, with strong setae dorsally and several setulae near anterior margin; first flagellomere grey-yellow. Facial carina slightly developed. Clypeus medially orange brown, laterally dark brown. Palpus grey-yellow except basal grey-black part, rod-shaped, with several stout setae on lateral margin. Vibrissa prominent; other orals small. Postgena dark brown.

Thorax. Brown-yellow, with four narrow black stripes on scutum and a few dark brown patches on pleura. Postpronotal lobe paler, with a long and two to four small setae. Acrostichal setulae in about 10 irregular rows. Scutellum dark brown except grey-brown posterior margin; basal scutellar setae divergent; apicals cruciate. Katepisternal setae two.

Wing. Hyaline; veins grey-yellow. C_1 setae less differentiated. Basal medial-cubital crossvein present. Costal vein with 21–22 minute spinules on ventral surface between R_{2+3} and R_{4+5}. R_{2+3} slightly curved to costa at tip; R_{4+5} and M_1 distally slightly convergent. Halter white.

Legs. Entirely yellow. Fore femur with two to three rows of setae on posterodorsal to posteroventral surface. Preapical dorsal seta present on tibiae of all legs. Apical seta present on mid tibia. Fore tarsus with two to four strong setae on basoventral surface. Mid tarsus ventrally with two rows of minute cuneiform setulae; hind tarsus lacking minute cuneiform setulae; fore first tarsomere shorter than the rest combined; mid and hind first tarsomeres longer than the rest combined.

Abdomen. Tergites dark brown to black; second to fourth each with broad, dark brown band on posterior margin. Sternites pale yellow.

Male terminalia. Epandrium strongly protruded at anteroventral corners, with about 27 setae near posterior margin and pubescence except anteroventral margin (Figure 4). Surstylus apically protruded, with a few setulae on apical margin (Figure 4). Cercus separated from epandrium, small, somewhat semicircular, nearly entirely pubescent and densely setigerous (Figure 4). Tenth sternite laterally fused to surstyli, with small pubescent median piece and a pair of elongated lateral arms apically contiguous to base of gonopod (Figures 5, 6). Hypandrium plate-like anteromedially (Figure 7). Parameres slightly curved ventrad, basally articulated with aedeagal apodeme (Figure 6). Gonopods fused to each other, forming posteromedian plate, anteriorly broadened, posterolaterally contiguous to posterior ends of hypandrium and apices of epandrial anteroventral elongations (Figure 6). Aedeagal outer membrane posteriorly connected to gonopod, with numerous sclerotized small pieces (Figure 6). Aedeagal median rod basally articulated with aedeagal apodeme (Figure 6). Aedeagal apodeme long rod-like (Figure 6); ventral branches of aedeagal apodeme apically fused to each other (Figure 6).

Measurements. BL=4.25 mm in the holotype (range in 2 paratypes: 3.80–4.35); ThL=2.19 mm (1.91–2.30); WL=3.83 mm (3.45–4.00); WW=1.86 mm (1.53–1.84).

Indices. arb=7–8/4–5 (7–8/3–5), avd=0.98 (0.87–1.03), adf=1.46 (1.40–1.47), flw=3.45 (2.83–3.50), FW/HW=0.39 (0.30–0.34), ch/o=0.04 (0.04–0.06), prorb=0.74 (0.73–1.06), rcorb=0.71 (0.81–0.91), vb=0.40 (0.22–0.47), dcl=0.48 (0.34–0.43), presctl=0.62 (0.66–0.71), sctl=0.99 (1.01–1.24), sterno=0.89 (0.79–1.17), orbito=1.24 (1.63–1.77), dcp=0.25 (0.23–0.30), sctlp=1.17 (1.21–1.45), C=3.02 (2.45–2.71), 4c=0.77
Type material

Holotype: ♂, China: Menglun, Xishuangbanna, Yunnan, 24°41’N, 101°25’E, altitude 580 m, 12 September 2002, ex around human eyes, H.-W. Chen leg. (SCAU). Paratypes: 2♂, same data as holotype (SCAU, 1♂ terminalia dissected and abdomen used to extract DNA).

Distribution

China (Yunnan).

Etymology

A combination of the Latin words: longus+cilium, referring to the long aristal branches (adf larger than 2.0).

*Apsiphortica melanogaster* Chen, sp. nov.

(Figures 7–9)

Figures 7–9. *Apsiphortica melanogaster* Chen, sp. nov. (7) ♂ epandrium, cercus, surstylus, hypandrium, gonopod, paramere, aedeagal median rod, and aedeagal apodeme, lateral view. (8) ♂ surstylus and 10th sternite, ventral view. (9) ♀ 8th sternite, ventral view. For abbreviations see Figures 1–3. Scale bars: 0.1 mm.
Diagnosis

Paramere bifurcated from base, anterior one with pubescence (Figure 7); aedeagal median rod strong, black, bifurcated basally (Figure 7); aedeagal outer membrane with about 12 sclerotized, long, apically hook-like pieces (Figure 7).

Description

Some characters commonly seen in *A. longiciliata* are not referred to in the following description.

Thorax. Brown-yellow, with a broad black stripe medially on scutum and a few dark brown patches on pleura. Scutellum grey-brown.

Legs. Yellow except black third to fifth tarsomeres and apical part of all tibiae.

Abdomen. Second to fourth tergites yellow, each with narrow, dark brown band on posterior margin; fifth and sixth tergites nearly black.

Male terminalia. Epandrium not so strongly protruded at anteroventral corners, with about 30 setae near posterior margin and pubescence (Figure 7). Surstylus broadened, apically protruded, with a few setulae on apical margin (Figure 7). Tenth sternite with small non-pubescent median piece (Figure 8). Aedeagal median rod slightly curved dorsad, basally with strong dorsal process (Figure 7). Ventral branches of aedeagal apodeme apically separated from each other.

Female terminalia. Eighth sternite (oviscapt) slightly rhombus, nearly entirely pubescent and densely setigerous, with two sclerotized lobe-like processes distolaterally (Figure 9).

Measurements. BL = 4.00 mm in the holotype (range in 5♂ and 4♀ paratypes: 4.00–4.50); ThL = 2.08 mm (2.10–2.55); WL = 3.30 mm (3.30–3.95); WW = 1.50 mm (1.45–1.60).

Indices. arb = 8/5 (7–9/3–5), avd = 1.01 (0.97–1.10), adf = 2.10 (1.93–2.62), flw = 2.25 (2.06–2.41), FW/HW = 0.33 (0.34–0.38), ch/o = 0.05 (0.07–0.08), prorb = 0.88 (0.77–0.88), rcorb = 0.79 (0.75–0.92), vb = 0.37 (0.39–0.47), dcl = 0.44 (0.40–0.50), presctl = 0.75 (0.73–0.80), scl = 1.08 (1.00–1.15), sterno = 0.91 (0.88–0.95), orbito = 1.92 (1.92–2.13), dcp = 0.19 (0.16–0.23), sctlp = 1.32 (0.89–1.35), C = 2.41 (2.63–2.80), 4c = 0.94 (0.83–0.97), 4v = 1.92 (1.60–2.00), 5x = 0.97 (0.96–1.07), ac = 2.20 (2.07–2.33), M = 0.43 (0.38–0.45), C3F = 0.71 (0.67–0.75).

Type material

Holotype: ♂, China: Menglun, Xishuangbanna, Yunnan, 24°41′N, 101°25′E, altitude 780 m, 24 December 2003, ex around human eyes, H.-W. Chen leg. (SCAU). Paratypes: China: 5♂, 2♀, same data as holotype, except for 24–26 December 2003, S.-Y. Wen and H.-W. Chen leg. (SCAU); 3♂, 4♀ (1♂, 1♀, abdomen used to extract DNA), same data as holotype except for 11, 12 September 2002 (SCAU); 6♂, same data as holotype except for 17 April 2007, J.-J. Gao, F. Zhao, and H.-W. Chen leg. (2♂, KIZ; 2♂, SCAU; 2♂, SEHU).
Distribution
China (Yunnan).

Etymology
A combination of the Greek words: melas+gaster, referring to the fifth and sixth abdominal tergites nearly black.

*Apsiphortica multiclavata* Chen and Toda, sp. nov.
(Figures 10, 11)

Diagnosis
Epandrium without strong setae on ventral margin (Figure 10); aedeagal outer membrane with 13 elongated, tentacle-like, sclerotized pieces (Figure 11).

Description
Some characters commonly seen in *A. longiciliata* are not referred to in the following description.

**Head.** Eye dark brown. Frons and ocellar triangle nearly black. Clypeus dark brown. Palpus yellow-brown.

**Thorax.** Yellow, with brown patches on pleura. Scutellum brown.

**Abdomen.** Tergites yellow, each with black caudal band not reaching to lateral margins.

Figures 10, 11. *Apsiphortica multiclavata* Chen and Toda, sp. nov., ♂. (10) Epandrium, cercus, and surstylus, lateral view. (11) Hypandrium, gonopod, paramere, aedeagal median rod, and aedeagal apodeme, lateral view. For abbreviations see Figures 1–3. Scale bars: 0.1 mm.
Male terminalia. Epandrium pubescent, with 15–16 setae near posterior margin (Figure 10). Surstylus basally broad, ventro-apically narrowing and curved posterior, with setulae in two patches on dorso-apical corner and ventro-apical portion (Figure 10). Paramere articulated with base of aedeagus, extending ventrad, slightly longer and paler than tentacle-like pieces on aedeagal outer membrane, apically slightly dilated and serrated (Figure 11). Gonopods anteriorly with a pair of strongly sclerotized, divergent processes (Figure 11). Aedeagal median rod basally fused to aedeagal apodeme (Figure 11). Ventral branches of aedeagal apodeme very small, apically knobbed and strongly sclerotized, but not fused to each other (Figure 11).

Measurements. BL=3.42 mm in the holotype (3.88 in 1 (male) paratype); ThL=1.72 mm (1.68); WL=2.60 mm (2.80); WW=1.28 mm (1.20).

Indices. arb=7/2–4 (7/3), avd=0.90 (0.87), adf=2.20 (2.50), flw=2.00 (1.75), FW/HW=0.38 (0.34), ch/o=0.04 (0.04), prorb=0.95 (0.90), rcorb=0.65 (0.60), vb=0.40 (0.40), dcl=0.47 (0.55), presctl=0.60 (0.70), sctl=0.85 (0.80), sterno=1.05 (1.05), orbito=1.80 (1.80), dcp=0.26 (0.27), scotp=0.95 (1.00), C=2.67 (2.63), 4c=1.00 (0.94), 4v=2.00 (1.65), 5x=1.40 (1.14), ac=3.00 (3.20), M=0.47 (0.50), C3F=0.67 (0.63).

Type material
Holotype: ♂ (terminalia dissected), Malaysia: Ulu Senagang, Crocker Range Park, Sabah, 18 October 1999, ex around human eyes, M. J. Toda leg. (KPSP). Paratype: 1♂, same data as holotype (SEHU).

Distribution
Malaysia (Sabah).

Etymology
A combination of the Latin words: multus+clava, referring to the rod-like processes on the aedeagal outer membrane.

Apsiphortica xui Chen, sp. nov.
(Figures 12–14)

Diagnosis
Aedeagal median rod dorsally with strong subbasal process (Figure 12); aedeagal apodeme broadened, horizontally flattened (Figure 14); ventral branch of aedeagal apodeme sclerotized, slightly expanded apically, with a projection submedially (Figures 12, 14).

Description
Some characters commonly seen in A. longiciliata are not referred to in the following description.
Thorax. Yellow, with five narrow black stripes on scutum and a few dark brown patches on pleura. Scutellum grey-brown.

Abdomen. Tergites yellow, each with broad, dark brown band on posterior margin.

Male terminalia. Epandrium strongly protruded at anteroventral corners, with about 28 setae near posterior margin and pubescence except for anteroventral margin (Figure 12). Tenth sternite with non-pubescent median piece (Figure 13). Hypandrium arched, slightly broadened anteromedially (Figure 14). Parameres separated from each other (Figures 12, 14). Aedeagal outer membrane with about eight sclerotized small pieces (Figures 12, 14). Aedeagal median rod apically round, basally fused with aedeagal apodeme (Figures 12, 14).

Measurements. BL=4.30 mm in the holotype; ThL=2.13 mm; WL=3.80 mm; WW=1.75 mm.

Indices. arb=10/6, avd=1.00, adf=1.38, flw=1.94, FW/HW=0.38, ch/o=0.06, prorb=0.87, rcorb=0.70, vb=0.52, dcl=0.46, presctl=0.50, stctl=1.00, sterno=0.88, orbito=2.08, dcp=0.16, scltp=0.96, C=3.07, 4c=0.81, 4v=1.72, 5x=1.13, ac=2.01, M=0.48, C3F=0.63.

Type material
Holotype: ♂ (terminalia dissected), China: Xianheping, Anlong, Guizhou, 24°59’N, 105°36’E, altitude 1290 m, 28 May 2006, ex around human eyes, M. F. Xu leg. (SCAU).
**Distribution**

China (Guizhou).

**Etymology**

Patronym, in honor of Mr M.-F. Xu (SCAU).

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**Key to all species of the genus Apsiphortica Okada (male)**

| Option                                                                 | Code | Description                                                                                                                                       |
|-----------------------------------------------------------------------|------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| 0 Interfrontal setae thick; anepisternum with several setulae; paramere lacking sensilla; aedeagal median rod with dorsal process(es) or projection(s) subbasally; aedeagal outer membrane with sclerotized pieces (genus *Apsiphortica*) | 1    |  
| 1 Hypandrium only slightly broadened anteromedially; aedeagal apodeme broad, horizontally flattened | 2    |  
| - Hypandrium plate-like anteromedially; aedeagal apodeme long rod-like, nearly straight. | 3    |  
| 2 Paramere shorter than half aedeagal median rod; aedeagal median rod fused to aedeagal apodeme | 4    |  
| - Paramere longer than half aedeagal median rod; aedeagal median rod not fused to aedeagal apodeme | 5    |  
| 3 Aristal branches short (adf smaller than 1.5); epandrium protruded at anteroventral corners; aedeagal median rod apically dilated roundly in ventral view; aedeagal outer membrane with two small sclerotized pieces | 6    |  
| - Aristal branches long (adf larger than 2.0); epandrium not protruded at anteroventral corners; aedeagal median rod apically not dilated; aedeagal outer membrane with 13 elongated, tentacle-like, sclerotized pieces | 7    |  
| 4 Legs yellow except black third to fifth tarsomeres and apical part of all tibiae; paramere bifurcated from base, anterior one with pubescence | 8    |  
| - Legs entirely yellow; paramere neither bifurcated nor pubescent | 9    |  
| 5 Aedeagal median rod subapically without triangular projection, apically not bifurcated; paramere apically slightly expanded triangularly in lateral view | 10   |  
| - Aedeagal median rod dorsosubapically with small triangular projection, apically hook-like bifurcated; paramere apically not expanded | 11   |  

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**Acknowledgements**

We thank Dr T. Aotsuka (Tokyo Metropolitan University, Japan) and Prof. Y.-P. Zhang (KIZ) for supporting the fieldwork, Dr G. Bächli (ZMZ) and Dr A. Shinohara (NSMT) for the loan of the type specimens from the museums, and Drs S.-Y. Wen, J.-J. Gao, Mrs F. Zhao, and M-F. Xu for providing us with invaluable specimens. This work was supported by the Japan Society for the Promotion of Science (no. 12375002), the National Natural
Science Foundation of China (no. 30470212) to H.-W.C., and Project 2-2 of the Research Institute for Humanity and Nature to M.J.T.

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