

Taxonomic studies on the subtribe Aphrastobraconina Ashmead (Hymenoptera: Braconidae: Braconinae) in China

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Wang, Y., Chen, X. & He, J. 2003: Taxonomic studies on the subtribe Aphrastobraconina Ashmead (Hymenoptera: Braconidae: Braconinae) in China. — Entomol. Fennica 14: 118–124.

The species of the subtribe Aphrastobraconina Ashmead from China were studied and five species belonging to three genera (*Undabracon* Quicke, 1986, *Curriea* Ashmead, 1900 and *Aphrastobracon* Ashmead, 1896) recognized. Three new species (*Undabracon cariniventris* sp. n., *Aphrastobracon huanjiangensis* sp. n. and *A. politus* sp. n.) are fully described and illustrated. The genus *Undabracon* (Quicke, 1986), the species *Aphrastobracon flavipennis* Ashmead and *Curriea tibialis* (Ashmead) are reported for the first time from China. A key to the species of the genus *Undabracon* is provided.

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Received 2 January 2003, accepted 30 April 2003

1. Introduction

Based on the nature of the far antefurcal vein *cu*-a and ovoid subdiscal cell of fore wing, *Aphrastobracon* Ashmead was placed in its own tribe Aphrastobraconini for the first time by Ashmead (1900). According to morphological and molecular phylogenetic studies, Quicke (1988, 2000) considered it as a subtribe Aphrastobraconina. Currently it consists of eight genera, namely *Aphrastobracon* Ashmead, 1896, *Cedilla* Quicke, 1990, *Curriea* Ashmead, 1900 (subgenera *Curriea* Ashmead and *Endovipio* Turner, 1922), *Eucurriea* Quicke, 1990, *Hewittella* Cameron, 1906, *Ligulibracon* Quicke, 1986, *Megalommum* Szépligeti, 1900 and *Undabracon* Quicke, 1986. Most taxonomists have recognized that the genus *Aphrastobracon* is closely related to the genera

Curriea and *Megalommum* (e.g. Ashmead 1900), whereas some authors have considered the latter two genera to be synonyms of *Aphrastobracon* (Fahringer 1928, Watanabe 1950, Baltazar 1963, Papp 1972, Shenefelt 1978, Tobias 1968). However, at present they all have been regarded as separate genera and can be identified by the keys provided by Quicke (1987), Quicke and Ingram (1993) and Quicke *et al.* (2000).

In the present paper, we sort the genera of the subtribe Aphrastobraconina from China. Five species belonging to the genera *Aphrastobracon* Ashmead, *Curriea* Ashmead and *Undabracon* Quicke are recognized, three of which (*Undabracon cariniventris* sp. n., *Aphrastobracon huanjiangensis* sp. n. and *Aphrastobracon politus* sp. n.) are new to science, and fully described and illustrated (see Results chapter). *Aphrastobracon*

flavipennis Ashmead, *Curriea tibialis* (Ashmead) and the genus *Undabracon* Quicke are reported for the first time in China. A key to the species of *Undabracon* is provided. The type and other voucher specimens are kept in the Parasitic Hymenoptera Collection, Zhejiang University, Hangzhou, China.

The morphological terminology used in this paper follows that of van Achterberg (1979) and Quicke (1987).

2. Taxonomy of *Aphrastobraconina* in China

2.1. Genus *Undabracon* Quicke

Undabracon Quicke, 1986: Ent. Mon. Mag. 122: 22–23; Quicke (1987): J. Nat. Hist. 21: 135; Quicke & Ingram (1993): Mem. Queensland Mus. 33: 332; Falco & Quicke (1997): Eur. J. Ent. 94: 547; Quicke *et al.* (2000): African Ent. 8: 110. Type species (monobasic and original designation): *Undabracon nigrithorax* Quicke.

The *Undabracon* Quicke is a small genus with two known species distributed in Australia and the Philippines. Below we provide a key to the *Undabracon* Quicke species and describe a new species, *Undabracon cariniventris* sp. n.

2.1.1. Key to the species of *Undabracon* Quicke

1. Vein cu-a of fore wing far antefurcal (Fig. 1d); ocellar triangle area brown; ovipositor with two or three strongly arch-like parts (Fig. 1l) 2
- Vein cu-a of fore wing slightly antefurcal (Fig. 1m); ocellar triangle area pale yellow; ovipositor with two weakly arch-like parts (Australia) (Fig. 1n) *Undabracon nigrithorax* Quicke
2. Second discal cell of fore wing with a dark brown spot; ovipositor with three arch-like parts (the Philippines) (Fig. 1o) *Undabracon sinuatus* (Baltazar)
- Second discal cell of fore wing without a dark brown spot; ovipositor with two arch-like parts (Southern China) (Fig. 1l) *Undabracon cariniventris* sp. n.

2.1.2. *Undabracon cariniventris* sp. n. (Figs. 1a–l)

Material examined. Holotype female, “[South China]: Province Guangxi, Baise, 2.vi.1982, He Jun-hua”.

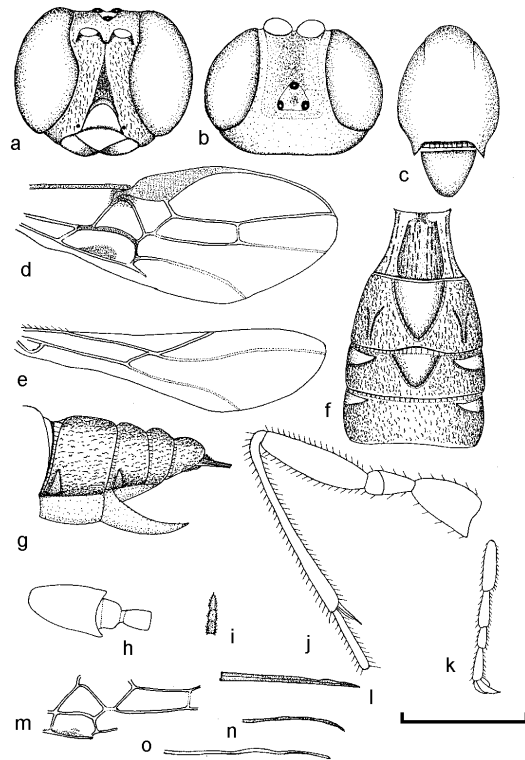


Fig. 1. — a–l. *Undabracon cariniventris* sp. n., holotype female. — m–n. *Undabracon nigrithorax* Quicke. — o. *Undabracon sinuatus* Baltazar. a = head, frontal aspect; b = head, dorsal aspect; c = mesothorax, dorsal aspect; d = fore wing; e = hind wing; f = first–fourth metasomal tergites, dorsal aspect; g = third–sixth metasomal tergites, lateral aspect; h = scapus, pedicellus and first flagellomere; i = terminal and subterminal flagellomeres; j = hind leg; k = tarsus of hind leg; m = partial venation of fore wing; l, n, o = ovipositor. Figures m and n redrawn after Quicke (1986) and figure o after Baltazar (1963). Scale bar: 2× (a–j, l); 2.5× (k).

Holotype female. Length of body 7.1 mm, fore wing 8.0 mm, ovipositor (part exerted beyond apex of metasoma) 3.5 mm.

Head. Antenna as long as fore wing, with 54 segments; scapus longer ventrally than dorsally, weakly emarginated apico-laterally, its length 1.9 times its depth apically (Fig. 1h); length of first flagellomere 1.5 times its maximum width, and 0.4 times length of scapus; apical flagellomere acuminate, 2.2 times as long as its maximum width and 1.4 times length of penultimate flagellomere (Fig. 1i); length of penultimate flagellomere 1.5 times its

width; third segment of maxillary palp of female 3.7 times as long as its maximum width; height of clypeus:inter-tentorial distance:tentorio-ocular distance = 5:7:4 (Fig. 1a); central area of face longitudinally rugulose, with one distinct triangular carina extending to antennal sockets (Fig. 1a); height of face (distance between clypeus and antennal sockets):width of face:width of head = 6:5:14 (Fig. 1a); frons distinctly impressed (Fig. 1b); shortest distance between posterior ocelli:transverse diameter of posterior ocellus:shortest distance between posterior ocellus and eye = 3:2:3.5 (Fig. 1b); vertex smooth and shiny.

Mesosoma. Mesosoma 1.70 times as long as high, smooth and shiny (Fig. 1c); notauli weakly impressed anteriorly, sparsely setose along the whole length; scutellar sulcus narrow and short, with distinct punctation and fine crenulation (Fig. 1c); metanotum with a wide carina medio-posteriorly; propodeum smooth and shiny medially, with long setae laterally.

Wings. Fore wing (Fig. 1d): length of pterostigma 2.9 times its maximum width; vein cu-a of fore wing far antefurcal; vein r arising half way of pterostigma; length of vein 1-SR 3.8 times vein 1-M; lengths of veins 2-SR+M:2-M:m-cu = 3.5:33:6; vein 1-SR+M distinctly curved basally; vein 2-CU1 distinctly thickened; lengths of veins 1-CU1:2-CU1:3-CU1 = 5:18:7; lengths of veins SR1:3-SR:r = 7:5:1, lengths of veins 2-SR:3-SR:r-m = 10:25:8. Hind wing (Fig. 1e): apex of vein C+SC+R with 3 bristles; vein 2-SC+R longitudinal and short, approximately 0.33 times vein 1r-m; vein SR curved; minimum width of marginal cell 0.5 times its apical width; basal cell usually with a distinct glabrous area distally; lengths of veins SC+R1:1r-m = 19:5.

Legs. Lengths of femur:tibia:tarsus of fore leg = 25:26:29; length of fore femur 6.1 times its maximum width; hind coxa smooth; hind tibia with a shallow lateral longitudinal depression; length of femur:tibia:basitarsus of hind leg = 30:44:15 (Fig. 1j); lengths of hind femur and tibia 5.1 and 7.3 times their width, respectively; length of hind basitarsus 2.1 times length of hind inner tibia spur (Fig. 1j).

Metasoma. Tergites with dense and short setae, densely granulate and punctated (Figs. 1f, 1g); length of first tergite 0.9 times its apical width; medio-longitudinally raised area of first tergite smooth basally,

rugulose and striate apically (Fig. 1f); second metasomal tergite with mid-basal raised triangle area surrounded by crenulate grooves; second metasomal suture deep and crenulate (Fig. 1f); third tergite with raised areas antero-laterally at either side, and weakly raised area medio-basally; fourth tergite with raised areas antero-laterally, but distinctly weak; fifth–seventh tergites rugulose and striate, without raised area antero-laterally; hypopygium pointed apically and not protruding behind the apex of metasoma; length of ovipositor as long as metasoma, and 0.5 times that of the body, with two distinctly arch-like areas apically (Fig. 1l).

Colour. Body largely pale yellow, wing membrane yellow; middle part of vein 2-1A brown; 3rd to 5th metasomal tergites dark brown antero-laterally, and yellowish brown medially; hind coxa, femur and ovipositor sheath dark brown.

Diagnosis. This new species is similar to *Undabracoon sinuatus* (Baltazar), their differences are listed in the above key.

2.2. Genus *Aphrastobracon* Ashmead

Aphrastobracon Ashmead, 1896: Proc. U.S. Nat. Mus. 18: 646; Watanabe (1950): J. Fac. Agric. Hokkaido (imp.) Univ. 48: 291–304; Baltazar (1963): Pacific. Ins. 5: 577–582; Tobias (1971): Trudy Vse. Ént. Obshchestva 54: 214; Papp (1972): Folia Ent. Hung., 25: 307; Shenefelt (1978): Hymen. Cat. (nov. editio) part 15: 1426–1430; Quicke (1987): J. Nat. Hist. 21: 100; Falco & Quicke (1997): Eur. J. Ent. 94: 547; Quicke *et al.* (2000): African Ent. 8: 109–111; Papp (2001): Reichenbuchia Mus. Tierkunde Dresden 30: 167–168. Type species (monobasic): *Aphrastobracon flavipennis* Ashmead.

In Shenefelt's Hymenopterorum Catalogue, the genus *Aphrastobracon* Ashmead comprised a total of 34 species distributed throughout the Old World tropics (Shenefelt 1978), but fourteen species were transferred to either *Curriea* Ashmead or *Iphiaulax* Foerster by Falco and Quicke (1997) and Quicke *et al.* (2000). Therefore, there are ca. 20 valid species in this genus at present.

One species of this genus (from India) has been recorded as a larval ectoparasitoid of the entomophagous noctuid *Eublemma* Hübner, 1821 (Lepidoptera: Noctuidae: Eustrotinae) that attacks coccoids including the lac scale insect *Kerria lacca* (Kerr) (Hemiptera: Coccoidea: Kerridae) (Ramakrishna 1926, Quicke *et al.* 2000).

2.2.1. *Aphrastobracon huanjiangensis* sp. n. (Fig. 2a–g)

Material examined. Holotype female. “[South China]: Province Guangxi, Huanjiang, 1.v.1981, Zhou Zhi-hong”. Paratype: 1 female, “[South China]: Province Hunan, Nanmi, 8.vi.1980, Dong Xin-wang”.

Holotype female. Length of body 9.8 mm, fore wing 10.5 mm, ovipositor sheath 2.4 mm.

Head. Antenna with 65 segments; scapus with dense long setae, its length 2.3 times its apical width; length of first flagellomere 1.4 times its maximum width; apical flagellomere pointed, 2.2 times as long as its maximum width and 1.3 times length of penultimate flagellomere; penultimate flagellomere 1.8 times as long as wide; third segment of maxillary palp 4.1 times as long as its maximum width; tentorio-ocular distance: intertentorial distance: height of clypeus = 7:9:11 (Fig. 2a); face densely granulate and without carina or depression (Fig. 2a); height of face (distance between clypeus and antennal sockets): width of face: width of head = 14:15:40 (Fig. 2a); frons distinctly impressed; shortest distance between posterior ocelli: transverse diameter of posterior ocellus: shortest distance between posterior ocellus and eye = 4:2.5:4 (Fig. 2b); vertex largely smooth and shiny, and sparsely setose posterolaterally.

Mesosoma (Fig. 2c). Length of mesosoma 1.78 times its height, smooth, shiny and sparsely setose laterally; notauli weakly impressed and complete; scutellar sulcus narrow and distinctly crenulate; metanotum with a weak carina posteriorly; propodeum smooth and shiny, with long setae laterally and shallow depression medially.

Wings. Fore wing (Fig. 2d): vein 1-SR+M weakly curved distally; length of vein 1-SR 0.5 times vein 1-M; lengths of veins 2-SR+M:2-M:mcu = 4:36:15; lengths of veins 1-CU1:2-CU1:3-CU1 = 10:20:9; lengths of veins SR1:3-SR:r = 55:19:10; lengths of veins 2-SR:3-SR:r-m = 15:19:12; veins 1-CU1, CU1b and base of vein 1-M strongly expanded. Hind wing (Fig. 2e): vein C+SC+R with dense long thickened setae basally; vein 2-SC+R longitudinal; vein 1r-m weakly curved basally; lengths of veins SC+R1:r-m = 31:9.

Legs. Lengths of femur:tibia:basitarsus of fore leg = 31:35:18; lengths of fore femur and tibia 5.1 times and 8.3 times their widths, respectively;

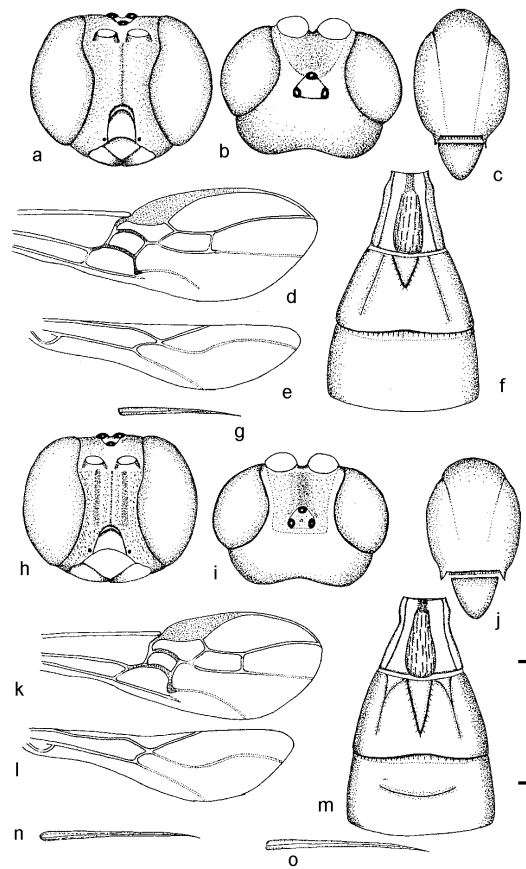


Fig. 2. — a–g. *Aphrastobracon huanjiangensis* sp. n., holotype female. — h–n. *Aphrastobracon politus* sp. n., holotype female. — o. *Aphrastobracon philippinensis* Baker. a, h = head, frontal aspect; b, i = head, dorsal aspect; c, j = mesothorax, dorsal aspect; d, k = fore wing; e, l = hind wing; f, m = first-third metasomal tergites, dorsal aspect; g, n, o = ovipositor. Figure o redrawn after Baltazar (1963). Scale bar: 2× (a–f, h–m); 0.5× (g, n).

hind coxa shiny, with dense, long setae; lengths of femur:tibia:basitarsus of hind leg = 46:63:31; lengths of hind femur and tibia 3.7 times and 8.9 times their maximum widths, respectively; hind femur sparsely setose, and tibia with dense short setae.

Metasoma (Fig. 2f). Metasoma densely setose; length of first tergite 1.2 times its apical width, apical raised area with shallow depression medially and short setae laterally; second tergite with basal-median triangular area surrounded by crenulate groove, which extends approximately

to two-fifths of median length of second tergite; second metasomal suture deep medially and shallow laterally; third tergite without transverse groove sub-posteriorly; fourth–sixth tergites with moderately dense setae and without transverse grooves sub-posteriorly; length of ovipositor 0.25 times that of body.

Colour. Body yellow except antenna; venation, hind tibia and tarsus dark brown.

Diagnosis. This species is similar to *A. flavipennis* Ashmead, but differs from the latter by the characters as follows: body largely yellow; vein 1-SR of fore wing basally without dark brown spots (Figs. 2d, 2e); length of ovipositor 0.25 times that of body; apex of ovipositor relatively sharper and slender (Fig. 2g).

2.2.2. *Aphrastobracon politus* sp. n. (Fig. 2h–n)

Material examined. Holotype female, “[Central China]: Province Henan, Yichuan, 11–12.vii.1996, Cai Ping”. Paratype: 1♂, “[East China]: Hangzhou, 26.vi.1937, Chu Joo-Tso”.

Holotype female. Length of body 6.7 mm, fore wing 9.5 mm, ovipositor (part exerted beyond apex of metasoma) 2.6 mm.

Head. Antenna broken, with 50 segments remaining; length of scapus 2.0 times its apical width; length of first flagellomere 1.3 times its maximum width, and 0.5 times length of scapus; third segment of maxillary palp of female 3.8 times its maximum width; height of clypeus:inter-tentorial distance:tentorio-ocular distance = 6:8:4 (Fig. 2h); face granulate, with longitudinal carina distinctly extending to between the antennal socket (Fig. 2h); height of face (distance between clypeus and antennal socket):width of face:width of head = 15:12:34 (Fig. 2h); frons strongly impressed; shortest distance between posterior ocelli:transverse diameter of posterior ocellus:shortest distance between posterior ocellus and eye = 3:2:4 (Fig. 2i); vertex smooth and shiny, without setae.

Mesosoma (Fig. 2j). Length of mesosoma 1.75 times its height, smooth and shiny; notauli weakly impressed on anterior half, and absent posteriorly; scutellar sulcus wide and deep, distinctly crenulate; metanotum with carina medio-posteriorly; propodeum smooth, shiny and with dense long setae laterally.

Wings. Fore wing (Fig. 2k): vein cu-a far antefurcal; vein 1-SR+M strongly curved distally; length of vein 1-SR 0.5 times vein 1-M; lengths of veins 2-SR+M:2-M:m-cu = 4:32:13; lengths of veins 1-CU1:2-CU1:3-CU1 = 10:17:8; lengths of veins SR1:3-SR:r = 53:25:8; lengths of veins 2-SR:3-SR:r-m = 13:25:10; veins 1-CU1 and m-cu strongly expanded; vein CU1b expanded close to intersection of veins 3-CU1 and CU1a. Hind wing (Fig. 2l): apex of the vein C+SC+R with one bristle; vein SR curved; vein 2-SC+R short and transverse; lengths of veins 1r-m:SC+R1 = 4:15.

Legs. Lengths of fore femur:tibia:basitarsus = 24:33:13; lengths of fore femur and tibia 4.8 and 8.2 times their widths, respectively; hind coxa smooth and shiny; lengths of hind femur:tibia:basitarsus = 4:6:2.3; lengths of hind femur and tibia 3.9 times and 9.8 times their maximum widths, respectively; hind femur with long sparse setae, and tibia densely, shortly setose.

Metasoma (Fig. 2m). First tergite as long as wide apically; median raised area smooth and shiny; second tergite with triangular area medio-basally surrounded by crenulate grooves that extends approximately to four-fifths of median length of second tergite, and with sub-parallel longitudinal grooves laterally; second suture wide medially, and narrow laterally; third tergite with transverse weak groove medially; fourth–sixth tergites smooth and shiny, moderately densely and evenly setose laterally, without transverse or longitudinal grooves; length of ovipositor 0.4 times that of body.

Colour. Body yellow except antennae; venation, hind tibia, tarsus and ovipositor sheath dark brown.

Diagnosis. This species is similar to *A. philippinensis* Baker, but differs from it by the following characters: second tergite with triangular area medio-basally surrounded by crenulate grooves that extends approximately to four-fifths of media length of second metasomal tergite, and with sub-parallel longitudinal grooves laterally (Fig. 2m); length of ovipositor 0.4 times that of body.

2.2.3. *Aphrastobracon flavipennis* Ashmead (Fig. 3a–c)

Aphrastobracon flavipennis Ashmead, 1896: Proc. U.S. Nat.

Mus. 18: 648; Watanabe (1950): J. Fac. Agric. Hokkaido (imp.) Univ. 48: 294; Tobias (1971): Trudy Vse. Ént. Obshestva 54: 214; Papp (1972): Folia Ent. Hung. 25: 307; Shenefelt (1978): Hym. Cat. (nov. editio) part 15: 1427.

Material examined. 2 ♀♀, “[South China]: Province Guangdong, Xiu-wen, 19.ix.1980, Zou Xing-gen; Province Fujian, Kangshang, 9.ix.1983, Wang Jia-she”.

Hosts. According to Shenefelt (1978), the actual hosts were *Eublemma amabilis* Moore, *Eublemma coccidiphaga* Hmps. and *Eublemma scitula* Ramb. (Lepidoptera: Noctuidae).

Distribution. China (Fujian, Guangdong), Ceylon, India.

2.2.4. *Aphrastobracon philippinensis* Baker, 1917

This species was previously reported from Formosa, Taiwan by Watanabe (1950), but no specimens were available for this study.

2.3. Genus *Curriea* Ashmead, 1900

Curriea Ashmead, 1900: Proc. U.S. Nat. Mus. 23: 137; Fahringer (1928): Opusc. Bracon. 2: 154; Watanabe (1937): J. Fac. Agric. Hokkaido (imp.) Univ. 42: 15; Papp (1972): Folia Ent. Hung., 25: 307; Shenefelt (1978): Hym. Cat. (nov. editio) part 15: 1426–1430; Quicke (1987): J. Nat. Hist. 21: 109; Falco & Quicke (1997): Eur. J. Ent. 94: 547–552; Quicke *et al.* (2000): African Ent. 8: 109–139. Type species (monobasic and original designation): *Curriea fasciatipennis* Ashmead.

Endovipio Turner, 1922: Ann. Mag. Nat. 10: 270–271; Shenefelt (1978): Hym. Cat. (nov. editio) part 15: 1430; Quicke (1987): J. Nat. Hist. 21: 110; Falco & Quicke (1997): Eur. J. Ent. 94: 549; Quicke *et al.* (2000): African Ent. 8: 138. Type species (monotype): *Endovipio ceresensis* Turner, syn. by Falco & Quicke (1997).

Curriea Ashmead is a medium-sized genus with 34 species distributed in the Palaearctic, Afrotropical and Australian Regions, with the majority of the species confined to the tropics (Falco & Quicke 1997, Quicke *et al.* 2000, Papp 2001). Of these, 14 species were recently transferred from *Aphrastobracon* (Quicke 2000). The genus *Curriea* is closely related to *Aphrastobracon*. Nothing is known about the biology of this genus at present.

The species *Curriea tibialis* (Ashmead) is reported from China for the first time in this paper.

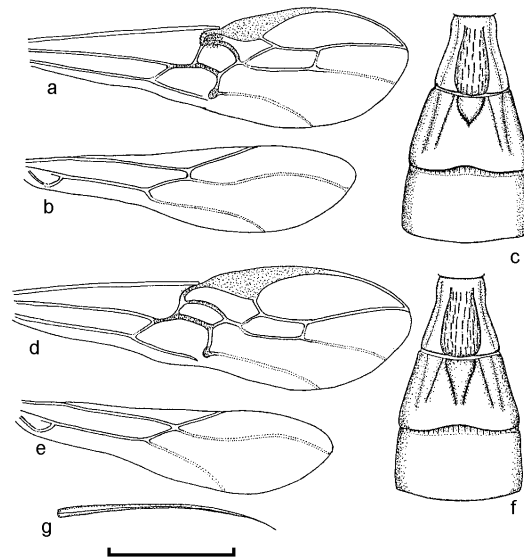


Fig. 3. — a–c. *Aphrastobracon flavipennis* Ashmead. — d–g. *Curriea tibialis* (Ashmead). a, d = fore wing; b, e = hind wing; c, f = first–third metasomal tergites, dorsal aspect; g = ovipositor. Scale bar: 2× (a–f); 0.5× (g).

2.3.1. *Curriea tibialis* (Ashmead) (Fig. 3d–g)

Melanobracon tibialis Ashmead, 1906: Proc. U.S. Nat. Mus. 30: 159.

Atanycolus tibialis Fahringer, 1928: Opusc. Bracon. 1: 519.

Curriea tibialis Watanabe, 1937: J. Fac. Agric. Hokkaido (imp.) Univ. 42: 15; Quicke (1997): Eur. J. Ent. 94: 548.

Aphrastobracon tibialis Watanabe, 1950: J. Fac. Agric. Hokkaido (imp.) Univ. 48: 294; Shenefelt (1978): Hym. Cat. (nov. editio) part 15: 1430.

Material examined. 5 females, “[South China]: Province Guangxi, Jinxiu, 19.ix.1980, Huang Chong-rong”; “Province Zhejiang, W. Mt. Tianmu, 3.vi.1999, 22.vi.1999, 21.vii.1998, 28.vii.1998, Zhao Ming-shui, light trapping”.

Distribution. China (Zhejiang, Guangxi), Japan.

Acknowledgements. We wish to thank Dr Donald L. J. Quicke (London, U.K.), C. van Achterberg (Leiden, The Netherlands) and Jenő Papp (Budapest, Hungary) for providing their literature. This study was funded by the National Natural Science Foundation of China (No. 30170120).

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