

THREE NEW SPECIES OF *DICHOCHRYSA* (INSECTA: NEUROPTERA: CHRYSOPIDAE) FROM CHINA, WITH A CHECKLIST OF CHINESE *DICHOCHRYSA*

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ABSTRACT. – The history of the genus *Dichochrysa* (Chrysopidae) is briefly introduced. Three new species of *Dichochrysa* are described: *Dichochrysa arcuata*, new species, *D. flavinotala*, new species, and *D. pilinota*, new species. Most specimens examined are preserved in the Insect Collections of Institute of Zoology, Chinese Academy of Sciences, except those noted with brackets, which are deposited in the Zoological Reference Collection of the Raffles Museum of Biodiversity Research, National University of Singapore. A checklist of Chinese *Dichochrysa* is also presented.

KEY WORDS. – Insecta, Neuroptera, Chrysopidae, *Dichochrysa*, new species, China.

INTRODUCTION

Dichochrysa Yang, 1991 (Neuroptera: Chrysopidae) was established with the type species *Dichochrysa eumorpha* (Yang & Yang, 1990a). Initially, *Dichochrysa* was originated from other three genera of Chrysopidae: *Mallada* Navás, 1925, *Anisochrysa* Nakahara, 1955, and *Navasius* Yang & Yang, 1990a.

Mallada was established by Navás in 1925, and its type species is *Mallada stigmatus* Navás, 1925. *Anisochrysa* was established by Nakahara in 1955, and its type species is *Anisochrysa paradoxa* Nakahara, 1955. However, Adams (1959) proved that both *Mallada stigmatus* and *Anisochrysa paradoxa* are synonyms of *Chrysopa basalis* Walker, 1853. Moreover, Adams (1975) transferred *Chrysopa basalis* from the genus *Chrysopa* to the genus *Mallada*, and *Mallada basalis* (Walker, 1853) become the type species of the genus *Mallada*. Therefore, according to the Principle of Priority, *Anisochrysa* is also the synonym of *Mallada*.

However, while conducting comparative morphology research on *Mallada*, Yang & Yang (1990a) considered the morphological characters of many species of *Mallada* to be different from those of the type species (*Mallada basalis*). So they think that *Mallada* is actually a heterogeneous genus, and should actually be divided into two genera: those species in accord with the morphological characters of *M. basalis* (Walker) remained in the *Mallada*, while other species different from the morphological characters of *M. basalis* (Walker) were transferred from *Mallada* to a new genus: *Navasius* Yang & Yang, 1990, and its type species is *Navasius*

eumorphus Yang & Yang, 1990a. However, *Navasius* had been used as a genus name of Myrmeleonidae (Neuroptera) (see Esben-Petersen, 1936). So Yang (1991) gave another new name – *Dichochrysa* to substitute *Navasius*. *Dichochrysa* was named based on the shape of forked pseudopenis of this genus.

Currently *Dichochrysa* is the largest genus of Chrysopidae and includes more than 130 species in the world, mainly distributed in Palearctic Region, Oriental Region and African Region. However, based on our studying on the morphology, biology, zoogeography and phylogeny of *Dichochrysa*, we think that *Dichochrysa* may be a world-distributed genus, and that it is bound to be discovered in other zoogeographic regions in the future. In China, there are 58 species of *Dichochrysa* (including 3 new species), which occupy 43.0% of known species of *Dichochrysa*, further, there are 55 species occurring in Oriental Region parts of China, which occupy 88.7% of all known species (62 species) in Oriental Region. So, an assessment of the Chinese fauna within the context of the *Dichochrysa* fauna in the region as a whole would be of great value (Brooks, 1997), and we are preparing for this project.

In this paper, 3 new species of *Dichochrysa* are described with morphological diagnosis and male genitalia illustrations, holotypes and paratypes of which are deposited in the Insect Collections of Institute of Zoology, Chinese Academy of Sciences, Beijing, P. R. China. Some paratypes are also deposited in the Zoological Reference Collection (ZRC) of the Raffles Museum of Biodiversity Research, National University of Singapore.

TAXONOMY

***Dichochrysa* Yang, 1991**

Navasius Yang & Yang, 1990a: 327.
Pseudomallada Tsukaguchi, 1995: 67.
Dichochrysa Yang, 1991: 150.

Type species. – *Dichochrysa eumorpha* (Yang & Yang, 1990a).

Description. – Medium-sized species, head yellowish green, usually brownish sports on gena and Clypeus; Mandible broad and left mandible toothed; Antennae slender, longer or as long as the forewings. Pronotum yellowish-green, narrow on the anterior-parts and broad at the posterior-parts like a trapezia. Wing venation similar to that of *Mallada*, except for basal inner gradate meeting with branches of Rs, and basal outer gradate meeting with Psm. Sternites 8 and 9 fused, without any projection on the apex of sternite 9. Ectoprocts rounded, tignum, entoprocessus and gonapsis present; Median of the gonarcus slender, straight or triangular; Pseudopenis forked. The female genitale are of the common *Chrysopa* type.

Remarks. – Among Chrysopini of Chrysopinae, *Dichochrysa*, *Mallada* and *Chrysoperla* are similar and sometimes are difficult to discern them. However, they are different in following morphological characters:

1. Apex of abdomen in male (Figs. 1a-c):
Dichochrysa: ectoprocts moderate, apex of sternite 8+9 without any projection and invagination (Fig. 1a).
Mallada: ectoproct slender, apex of sternite 8+9 with projection (Fig. 1b).
Chrysoperla: ectoproct broad, apex of sternite 8+9 with invagination like a lip (Fig. 1c).
2. Male genitalia (Figs. 2a-c):
Dichochrysa: median of gonarcus slender, entoprocessus large, pseudopenis forked, gonapsis and tignum present (Fig. 2a).
Mallada: median of gonarcus broad and expanded, entoprocessus very small, pseudopenis (arcessus) not forked, gonapsis and tignum present (Fig. 2b).
Chrysoperla: median of gonarcus slightly broad, pseudopenis (arcessus) narrow with or without dorsal striations. Tignum present and gonapsis absent (Fig. 2c).

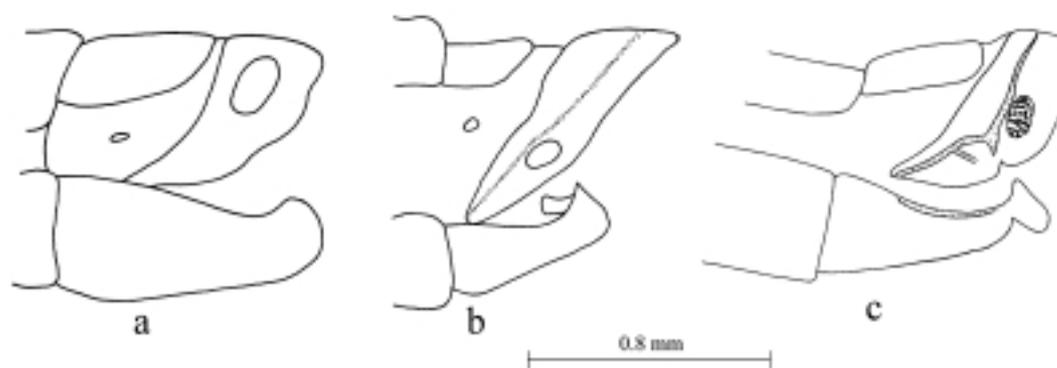


Fig. 1. Apex of abdomen in male. a. *Dichochrysa*; b. *Mallada*; c. *Chrysoperla*.

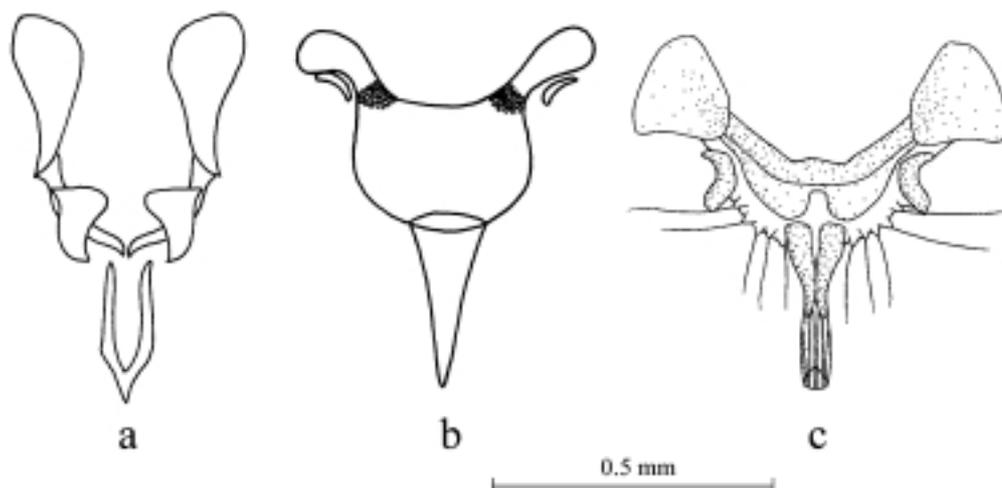


Fig. 2. Male genitalia. a. *Dichochrysa*; b. *Mallada*; c. *Chrysoperla*.

Distribution. – Palearctic Region; Oriental Region; African Region.

***Dichochrysa arcuata*, new species**
(Figs. 3a-f)

Material examined. – Holotype – male, Yunnan Prov.: Hekoudaweishan, coll. Zhou Yao & Yuan Feng, 10 July.1974.

Paratype – 1 female, Yunnan Prov.: Eshan County, 1100m, coll. Yang Ji-Kun, 2 Apr.1981.

Diagnosis. – Male adult (dried specimen). Length of body 10-12mm, of fore wings 11-12mm, of hind wings 9-10 mm. Head yellow, vertex protuberant, unmarked on the face. Palpi wholly yellow. Antennae longer than fore wings, scape yellow and dilated, slightly longer than wide or as long as wide; flagellum from yellow to brown gradually towards the apex. Pronotum yellowish-green, wider than long, narrow anteriorly and broad posteriorly like a trapezia; green in the lateral and

ventral view; two anterior-angles arc-shaped, a shallow transverse vitta before posterior-margin. Meso- and metathroax green in the dorsal and lateral view, yellow in the ventral view. Legs wholly yellow, claws brown and strongly curved, squarely dilated at base (Fig. 3a)

In fore wings, all veins of wings yellowish-green other than Cu_2 . Pterostigma yellow and without crossvein; Costal crossveins 15, R-Rs crossveins 10, branches of Rs 10; Psm-Psc 8; Cell *im* triangular, r-m crossvein above it; Cu_1 and Cu_3 yellow, Cu_2 brown; number of gradates (inner/outer) =3/6. In hind wings, all veins green, costal crossveins 12; R-Rs crossveins 10; branches of Rs 9; Psm-Psc 5; number of gradates (inner/outer) = 2/4 (left wings) and 2/5 (right wings).

Abdomen yellowish-green in dorsal and lateral view, yellow in ventral view. 7th tergite three times as long as 8th tergite (Fig. 3b). Ectoproct small and callus cerci proximal to the inner margin. 8+9 sternum slender and faintly broad at base and slightly narrow at apex. Gonarcus broad on bottom and

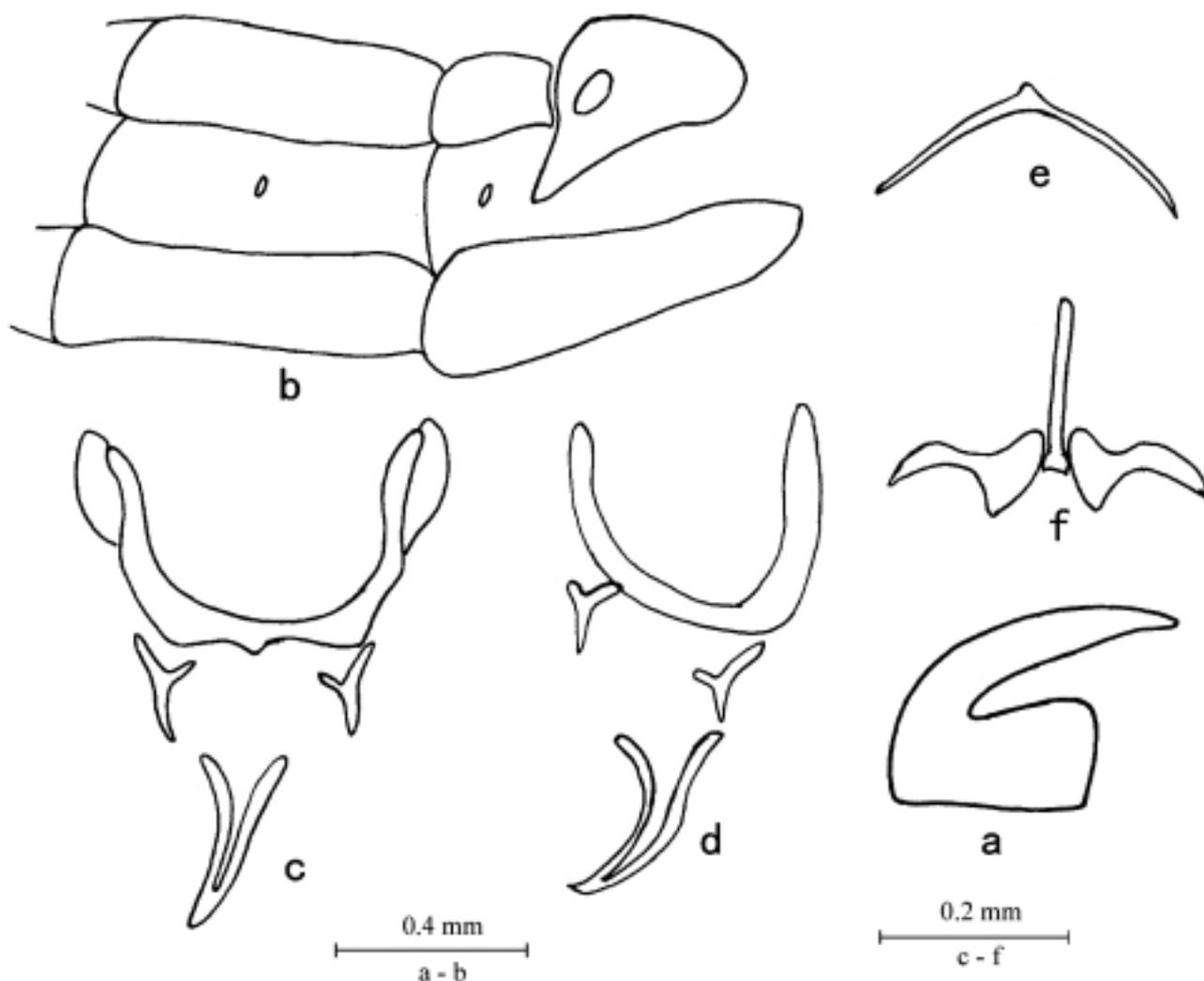


Fig. 3. *Dichochrysa arcuata*, new species, male. a. claw; b. apex of abdomen in male; c. male genitalia, ventral view; d. male genitalia, lateral view; e. tignum; f. gonapsis.

two lateral lobes expanded at apex (Figs. 3c, d). Entoprocessus bifurcated and like a “Y”. Pseudopenis bifurcated proximal to the bottom and tapered off. Two arms of tignum slender and arcessus small (Fig. 3e). Two lateral parts of gonapsis symmetrical and arcessus like a rod (Fig. 3f).

Etymology. – This new species is named according to arc-shaped anterior angles of pronotum.

Remarks. – This species resembles *Dichochrysa gradata* Yang & Yang, 1993, on the general form except that palpi of the latter are yellowish-brown, and yellow longitudinal mid-dorsal vitta is present on the thorax. In addition, the morphologic characters of entoprocessus, tignum and gonapsis of *D. gradata* are larger and broader than those of this species.

Distribution. – China: Yunnan.

Dichochrysa flavinotala, new species
(Figs. 4a-f)

Material examined. – Holotype - male, Yunnan Prov.: Menghai County: Mengdi, coll. Li Fa-Sheng, 17 May.1981.

Paratypes – 1 female (ZRC), same data as holotype; 1 female, Yunnan Prov.: Ruili County: Jiegao, 750m, coll. Yang Ji-Kun, 5 May.1981; 1 male 1 female, Yunnan Prov.: Eshan County: Huanian, 1100m, coll. Li Fa-Sheng, 2 Apr.1981; 1 male, Yunnan Prov.: Yuanjiang County, 380m, coll. Li Fa-Sheng, 4 Apr.1981; 1 male 1

female, Fujian Prov.: Xiamen City: Gulangyu, coll. Li Fa-Sheng, 25 Nov.1974.

Diagnosis. – Male adult (dried specimen). Length of body 7-8mm, of fore wings 11-12mm, of hind wings 9-10mm. Vertex yellow, face pale yellow and with genal marks. Two reddish slender transverse stripes under antennae, connected with two reddish longitudinal stripes on the inner lateral parts of genal marks; two reddish stripes above clypeus like a inverted “^”; genal marks reddish-brown or blackish-brown, small, rectangular; clypeal marks present or absent. Maxillary palpi yellow on 1st-2nd segments, brown on the dorsal parts of 3rd-4th segments, brown on 5th segment; labial palpi wholly yellow. Reddish slender stripes present between antennae and eyes. Scape swollen and longer than wide, reddish vitta present on outer-lateral parts; pedicel wholly red, flagellum from light brown to darkish brown gradually towards the apex. Prothorax wholly yellow, and pronotum longer than wide, from narrow on the anterior-parts to broad on the posterior-parts gradually and like a trapezia. Meso- and metathorax yellowish-green in dorsal and ventral view, green in lateral view. Legs yellow, claws strongly curved, squarely dilated at base (Fig. 4a).

In fore wings, densely clothed with brownish pubescence. Costal crossveins 16, green on the mid-parts and brown at two apical parts; pterostigma yellow and without crossvein. R-Rs crossvein 9, wholly yellowish-green; branches of Rs 8, wholly yellowish-green; Psm-Psc 6, wholly yellowish-green; cell *im* triangular, r-m crossvein above it. Cu yellowish-green;

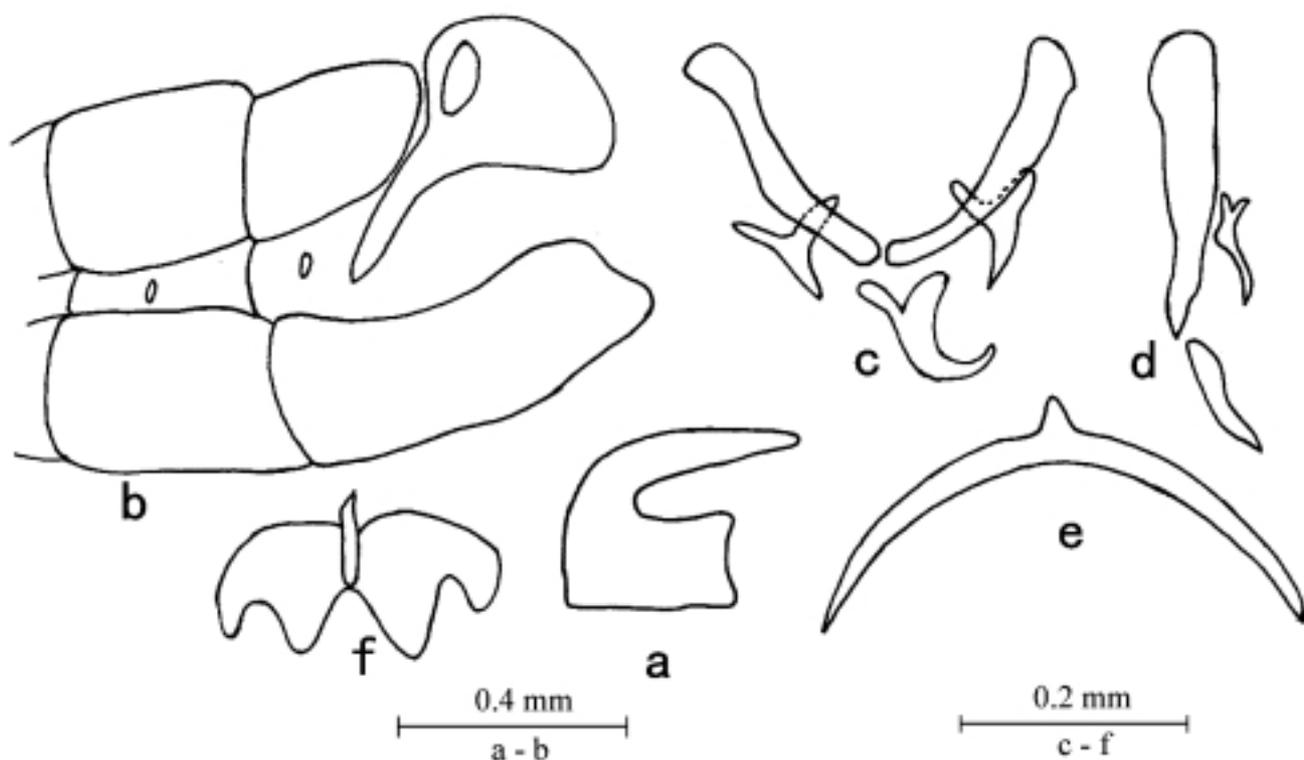


Fig. 4. *Dichochrysa flavinotala*, new species, male. a. claw; b. apex of abdomen in male; c. male genitalia, dorsal view; d. male genitalia, lateral view; e. tignum; f. gonapsis.

gradates brown on the mid-parts and green on two apical parts, (inner/outer) = 3/5 (left wing) and 3/6 (right wing). In hind wings, costal crossveins 14, brown proximal to Sc; R-Rs crossveins 8, brown proximal to R; branches of Rs 6, wholly yellowish-green; Psm-Psc 4, yellowish-green; gradates light brown, inner/outer = 2/4.

Abdomen yellowish-brown. 7th tergite as long as 8th tergite (Fig. 4b). Ectoproct narrowed on the half lower parts. Callus cerci proximal to the upper-inner margin. Basal parts of 8+9 sternum as wide as apical parts. Two lateral lobes of gonarcus divided on the bottom; entoprocessus like a “Y”; pseudopenis slightly bifurcated at top and tapered off towards bottom (Figs. 4c, d). Tignum large and tapered off towards two apex (Fig. 4e). Two lateral parts of gonapsis expanded and arcus slender (Fig. 4f)

Etymology. – This new species is named according to the colour of prothorax.

Remarks. – This species distinctly differs from its allied species *Dichochrysa allochroma* (Yang & Yang, 1990a) in the wholly yellow prothorax and without longitudinal mid-dorsal vitta. Besides, in *D. allochroma*, its two lateral parts of gonapsis do not expand, tignum is smaller than that of *D. flavinotala*, and entoprocessus is rectangle.

Distribution. – China: Fujian, Yunnan.

***Dichochrysa pilinota*, new species**
(Figs. 5a-f)

Material examined. – Holotype – male, Guizhou Prov.: Guiyang city: Huaxi, 1000m, coll. Li Fa-Sheng, 21 May.1981.

Paratypes – 2 females (ZRC), 4 females, same data as holotype; 8 females, same data as holotype, coll. Li Fa-Sheng & Liu Jing-Wen, 25-27 May.1981; 2 females, Fujian Prov.: Shaowu County: Chengguan, 150-220m, coll. Zhang You-Wei, 20 Jun.1963; 1 female, ditto: Institute of Forestry Science of Fujian Prov., coll. Yang Ji-Kun, 14 Aug.1987.

Diagnosis. – Male adult (dried specimen). Length of body 10mm, of fore wings 14mm, of hind wings 12mm. Head yellow with black genal marks. Maxillary palpi yellow on 1st-2nd segments, brown on dorsal parts of 3rd-4th segments and wholly 5th segment; labial palpi yellow on 1st-2nd segments, black on 3rd segment. Scape of antennae dilated, pedicel and flagellum wholly yellow. Pronotum yellow and clothed with white long hairs, tinged slightly with red marks on two lateral parts, with two shallow transverse sulci proximal to the hind margin. Meso- and metanotum wholly yellow. Legs yellow, claws brown, strongly curved, semicircular dilated at base (Fig. 5a).

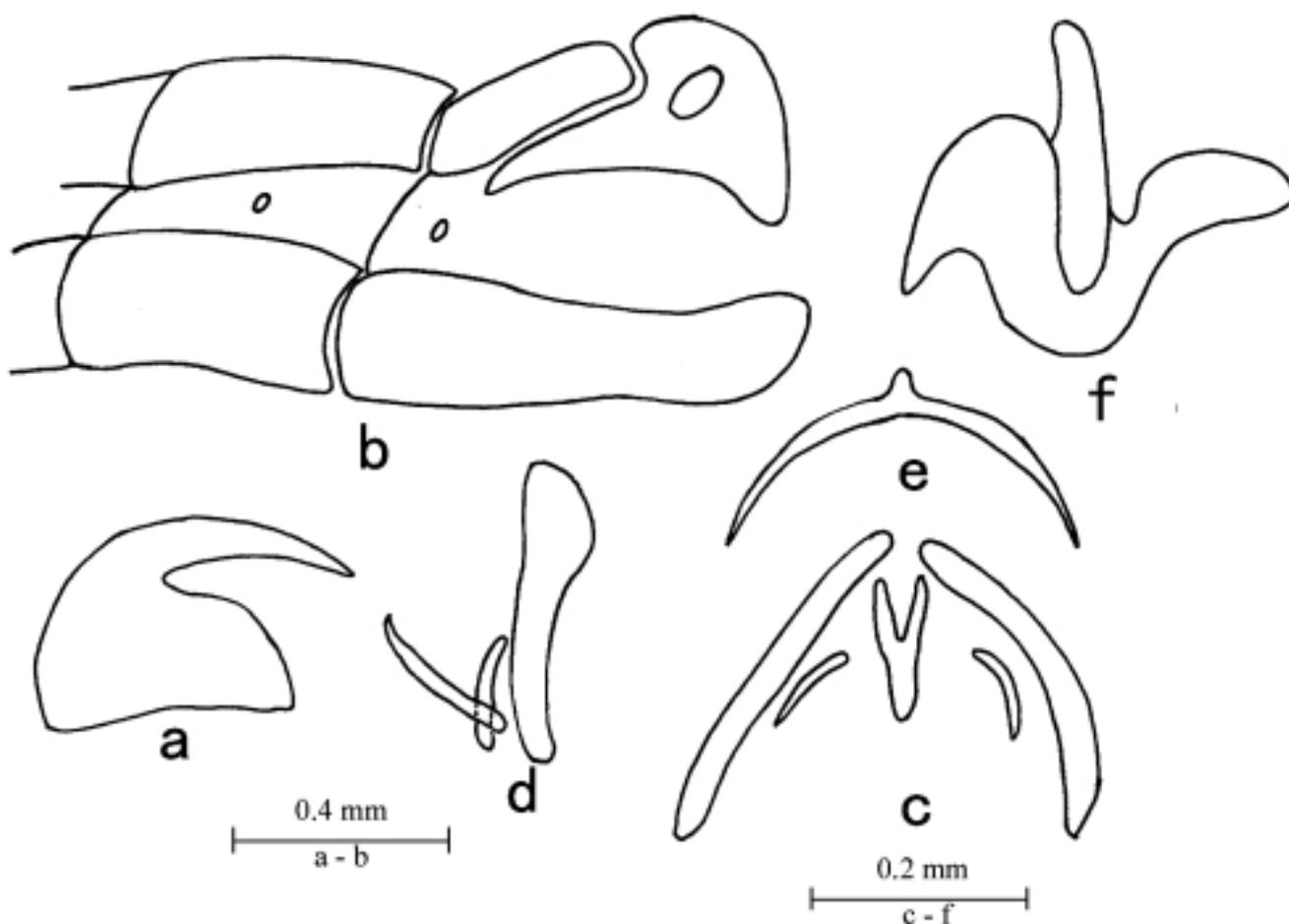


Fig. 5. *Dichochrysa pilinota*, new species, male. a. claw; b. apex of abdomen in male; c. male genitalia, ventral view; d. male genitalia, lateral view; e. tignum; f. gonapsis.

Fore wings clothed with long brown hairs. Costal crossveins 23, 1-13 brown, 14-23 yellowish-green; pterostigma yellow without crossvein; R-Rs crossveins 13, 1-4 brown proximal to half R vein, 5-13 wholly yellow; branches of Rs 11, yellowish-green; Psm-Psc 6, yellow. Cell *im* triangular, r-m above it; gradates light brown, inner/outer = 4/8. In hind wings, costal crossveins 15, light brown; R-Rs crossveins 12, light brown; branches of Rs 11, yellowish-green; Psm-Psc 5, yellowish-green; gradates light brown, inner/outer = 4/6.

In abdomen, 7th tergite longer than 8th tergite (Fig. 5b). Ectoproct small and leaning, tapered off on lower half. 8+9 sternum slender. Gonarcus divided on median and two slender lateral lobes (Fig. 5c, d). Entoprocessus arc-shaped. Pseudopenis bifurcated on median. Tignum and gonapsis as showed in Fig. 5e&f.

Etymology. – This new species is named according to the pile of long white hairs on the pronotum.

Remarks. – This new species is similar to *Dichochrysa forcipata* Yang & Yang, 1993, however, the latter, 3rd-5th segments of maxillary palpi and 3rd segment of labial palpi are blackish-brown and the pronotum has yellow longitudinal vitta. Besides, the tignum is broader and stronger than that of this new species.

Distribution. – China: Fujian, Guizhou.

CHECKLIST OF CHINESE *DICHOCHRYSA*

- Dichochrysa albofrontata* (Yang & Yang, 1990a): China: Fujian (Xiamen: Gulangyu, type locality).
- Dichochrysa allochroma* (Yang & Yang, 1990a): China: Fujian (Xiamen: Gulangyu, type locality).
- Dichochrysa alviolata* (Yang & Yang, 1990a): China: Inner Mongolia, Hainan (Jianfengling, type locality), Sichuan, Ningxia.
- Dichochrysa ancistroidea* (Yang & Yang, 1990a): China: Guangxi (Ningming County: Longrui, type locality).
- Dichochrysa arcuata*, new species: China: Yunnan (Eshan County).
- Dichochrysa aromatica* (Yang & Yang, 1989): China: Shaanxi (Zhouzhi County: Guanloutai, type locality).
- Dichochrysa barkamana* (Yang, Yang & Wang, 1992): China: Sichuan (Maerkang, type locality), Yunnan.
- Dichochrysa brachychela* (Yang & Yang, 1990a): China: Fujian (Dehua County: Shuikou, type locality), Guangxi.
- Dichochrysa chaoi* (Yang & Yang, 1990a): China: Fujian (Shaowu County, type locality).
- Dichochrysa choui* (Yang & Yang, 1989): China: Heilongjiang, Hubei, Yunnan, Shaanxi (Taibaishan, type locality), Gansu.
- Dichochrysa cognatella* (Okamoto, 1914): China: Shandong, Taiwan; Japan, Russia. (type locality unknown)
- Dichochrysa cordata* (Wang & Yang, 1992): China: Hunan (Sangzhi County: Tianpingshan, type locality), Guizhou.
- Dichochrysa decolor* (Navás, 1936): China: Jiangsu (Hufu, type locality).
- Dichochrysa degenana* (Yang, Yang & Wang, 1992): China: Yunnan (Deqin County: Meilishi, type locality).
- Dichochrysa diaphana* (Yang & Yang, 1990a): China: Fujian (Dehua County: Shuikou, type locality)
- Dichochrysa epunctata* (Yang & Yang, 1990a): China: Guangxi (Ningming County: Longrui, type locality).
- Dichochrysa estriata* (Yang & Yang, 1990a): China: Fujian (Xiamen: Gulangyu, type locality), Hubei, Hainan, Yunnan.
- Dichochrysa eumorpha* (Yang & Yang, 1990a): China: Fujian (Xiamen, type locality), Guangxi.
- Dichochrysa fanjingana* (Yang & Wang, 1988): China: Guizhou (Fanjingshan, type locality).
- Dichochrysa flammefrontata* (Yang & Yang, 1990a): China: Fujian (Xiamen, type locality), Yunnan, Shaanxi, Gansu.
- Dichochrysa flavinotala*, new species: China: Yunnan (Menghai County: Mengdi, type locality), Fujian.
- Dichochrysa flexuosa* (Yang & Yang, 1990a): China: Fujian, Guangdong (Guangzhou: Hedong, type locality), Sichuan.
- Dichochrysa forcipata* Yang & Yang, 1993: China: Fujian (Shaowu County, type locality), Guizhou.
- Dichochrysa formosana* (Matsumura, 1910): China: Taiwan; Japan. (type locality unknown)
- Dichochrysa fuscineura* (Yang, Yang & Wang, 1992): China: Sichuan (Guanxian, type locality).
- Dichochrysa gradata* (Yang & Yang, 1993): China: Guizhou (Guiyang: Huaxi, type locality).
- Dichochrysa hainan* (Yang & Yang, 1990a): China: Henan, Hubei, Hainan (Jianfengling, type locality), Sichuan, Yunnan.
- Dichochrysa hespera* (Yang & Yang, 1990a): China: Guangdong (Guangzhou, type locality), Hainan, Sichuan.
- Dichochrysa heudei* (Navás, 1934): China: Jiangsu (Hufu, type locality), Hainan, Yunnan, Shaanxi.
- Dichochrysa huashanensis* (Yang & Yang, 1989): China: Shaanxi (Huashan, type locality), Gansu.
- Dichochrysa hubeiana* (Yang & Wang, 1990): China: Hubei (Wuchang: Nanhu: Shixishan, type locality), Yunnan, Shaanxi.
- Dichochrysa ignea* (Yang & Yang, 1990b): China: Hainan (Anfeng County, type locality), Yunnan, Shaanxi.
- Dichochrysa illota* (Navás, 1908): China: Beijing, Henan, Hubei, Sichuan, Shaanxi, Gansu. (type locality unknown).
- Dichochrysa joannisi* (Navás, 1910): China: Shanxi, Jiangsu, Shanghai, Jiangxi.
- Dichochrysa kiangsuensis* (Navás, 1934): China: Jiangsu (Hufu, type locality), Guangxi, Hubei, Sichuan, Yunnan.
- Dichochrysa lii* Yang, Yang & Wang, 1999: China: Fujian (Fuzhou: Xihu, type locality).
- Dichochrysa longwangshana* Yang, 1998: China: Zhejiang (Anji County: Longwangshan, type locality), Guizhou.
- Dichochrysa lophophora* (Yang & Yang, 1990b): China: Shanghai, Hubei, Hainan (Ya County: Meishan, type locality), Yunnan.
- Dichochrysa mediata* Yang & Yang, 1993: China: Guizhou (Xingyi County, type locality), Xizang, Shaanxi.
- Dichochrysa medogana* (Yang, 1988): China: Xizang (Motuo County, type locality).
- Dichochrysa nigricornuta* (Yang & Yang, 1990b): China: Hainan (Jianfengling, type locality).
- Dichochrysa phantosula* (Yang & Yang, 1990b): China: Guangxi (Nanning, type locality)
- Dichochrysa pieli* (Navás, 1931): China: Shanghai (type locality).
- Dichochrysa pilinota*, new species: China: Guizhou (Guiyang: Huaxi, type locality), Fujian, Guizhou.
- Dichochrysa prasina* (Burmeister, 1839): China: Helongjiang; Aisa: Afghanistan, Anatolia, Armenia, China, Cyprus, Georgia, Iran, Iraq, Israel, Japan, Kirghizstan, Lebanon, Mongolei. Iberian peninsula. Mediterranean Region. Europe: Albania, Anatoli, Andorra, Austria, Belgium, Bulgaria, Czech, Denmark, Esthonia, Finland, France, Germany, Great

- Britain, Greece, Hungary, Italy, Latvia, Liechtenstein, Lithuania, Luxemburg, Moldova, Netherlands, Norway, Poland, Portugal, Roumania, Russia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine. Africa: Algeria, Morocco, Tunisia. (type locality unknown)
46. *Dichochrysa punctilabris* (McLachlan, 1894): China: Sichuan, Yunnan (type locality unknown).
47. *Dichochrysa qingchengshana* (Yang, Yang & Wang, 1992): China: Sichuan (Qingchengshan, type locality), Yunnan.
48. *Dichochrysa qinlingensis* (Yang & Yang, 1989): China: Hubei, Sichuan, Shaanxi (Qinling, type locality), Gansu, Anhui.
49. *Dichochrysa sana* (Yang & Yang, 1990b): China: Guangdong (Guangzhou, type locality), Sichuan.
50. *Dichochrysa triangularis* Yang & Wang, 1994: China: Yunnan (Ruili: Mengxiu, type locality).
51. *Dichochrysa tridentate* (Yang & Yang, 1990b): China: Hainan (Dan County, type locality), Yunnan.
52. *Dichochrysa verna* (Yang & Yang, 1989): China: Yunnan, Shaanxi (Nanwutai, type locality), Gansu.
53. *Dichochrysa vitticlypea* (Yang & Wang, 1990): China: Hubei (Shennongjia, type locality).
54. *Dichochrysa wangi* (Yang, Yang & Wang, 1992): China: Sichuan (Xiangcheng, type locality).
55. *Dichochrysa wuchangana* (Yang & Wang, 1990): China: Hubei (Wuchang, type locality).
56. *Dichochrysa xiamenana* Yang & Yang, 1994: China: Fujian (Xiamen, type locality), Yunnan.
57. *Dichochrysa yunnana* Yang & Yang, 1994: China: Fujian, Yunnan (Jinghong, type locality)
58. *Dichochrysa yuxianensis* (Bian & Li, 1992): China: Shanxi (Yu County, type locality).
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