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Bees of the *Colletes clypearis*-group (Hymenoptera: Apoidea: Colletidae) from China with descriptions of seven new species

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Abstract

Twenty-three known species of the *Colletes clypearis* species group from China are treated in this paper. *C. cinerascens* Morawitz 1893, *C. clypearis* Morawitz 1876, *C. floralis* Eversmann 1852, *C. impunctatus* Nylander 1852, *Colletes paratibeticus* Kuhlmann 2002 and *Colletes sodalis* (Cameron 1897) are newly recorded from China. *C. harrerioides* sp. n., *C. heilongtanensis* sp. n., *C. hirsutus* sp. n., *C. inspersus* sp. n., *C. xizangensis* sp. n., *C. xuezhongi* sp. n. and *C. yanruae* sp. n. are described and illustrated as new species. Checklist of the known species from China in *Colletes clypearis*-group with distribution, floral records, and an illustrated key to all known males and females from China are provided. The type

specimens of the new species are deposited in the Insect Collection of Institute of Zoology, Chinese Academy of Sciences, Beijing, China.

Key words: Apiformes, taxonomy, fauna, floral records, illustrated key, distribution

Introduction

The bee genus *Colletes* Latreille 1802 is characterized by the outwardly arcuate posterior part of the second recurrent vein, the bilobate glossa and by the base of the propodeum that has a short subhorizontal to vertical basal zone, usually limited posteriorly by a carina or sharp change in slope or sculpture, and divided by longitudinal carina (Michener 1989, 2007). *Colletes* currently includes 473 described species with an estimated total of about 700 species worldwide (Kuhlmann & Proshchalykin 2011; Proshchalykin & Kuhlmann 2012; Kuhlmann & Pauly 2013) from all continents except Antarctica, Australia and Madagascar (Michener 2007). About 206 species are described from the Palearctic region with their centre of diversity in Central Asia (Kuhlmann 2005, Kuhlmann & Quest 2006).

The *Colletes clypearis*-group comprises 28 described species from the Palearctic and Oriental regions (Kuhlmann 2011) making it the most speciose Palearctic species-group of *Colletes* representing 13.6% of the total fauna. Species of this group are mainly distributed in cooler biomes of higher mountains and high latitudes. Thus, it is no surprise that the vast and diverse Chinese mountain ranges harbor a diverse fauna of the *C. clypearis*-group including new taxa many still to be discovered. In the species of this group the disc of metasomal tergum 1 usually is sparsely covered with long erect hairs but without short appressed pilosity. Apical tergal hair bands are well developed with the one on tergum 1 in females usually not interrupted medially. The malar area is elongate, at least half as long as the width of the base of the mandible. In males tergum 7 is not elongate and apically more or less broadly truncate while sternum 7 is elongate and broadened at its base (Noskiewicz 1936).

China stretches over the Palearctic and Oriental region. Given its size as well as the geographical and climatic diversity and its direct neighborhood to one of the most important global centers of bee diversity in Central Asia (Kuhlmann 2005, 2006), the Chinese *Colletes* fauna is estimated to comprise 100–150 species (Kuhlmann, personal observation), but the species of the genus are largely unexplored in China. Currently little has been known about the *Colletes* fauna of China, only 37 species have been recorded so far (Kuhlmann 2000, 2002a, b, 2007, 2009a, b, unpublished records; Noskiewicz 1936; Wu 1965, 1982, 1987, 1992). Recently, Niu *et al.* (2013) reviewed the four species of the *Colletes succinctus*-group of China.

From a review of the literature and examination of specimens at the Insect Collection of Institute of Zoology, Chinese Academy of Sciences (IZCAS), we recognized twenty-three Chinese species of the *Colletes clypearis*-group (based on 431 specimens), including seven new species and six newly recorded species. A checklist of the species (Table 1), an illustrated key to all species of the *C. clypearis*-group known from China, and descriptions for the seven new species are provided in this paper.

Material and methods

All specimens examined are deposited in the Insect Collection of IZCAS, Beijing, China. The specimens were examined with a NIKON SMZ 1500 stereomicroscope. Attributes were recorded with a NIKON D7000 digital camera and dealt with Helicon Focus software. The terminology used in the descriptions follows Michener (2007) for general morphology. Absolute measurements, in millimeters (mm), are used for length of body. For all other structures, relative measurements are used. Some abbreviations used in the descriptions by Niu *et al.* (2004, 2012) as follows: BL (body length): measured from the base of the antennal socket to the apex of the metasoma; HL (head length): measured from the apicomedian margin of the clypeus to the upper margin of the vertex in frontal view; HW (head width): measured at the widest point of the head across the compound eyes in frontal view; EW (eye width): the greatest width of eye in lateral view; GW (genal width): the greatest width of the gena in lateral view; MtW (metasomal width): measured at the widest metasomal tergum in dorsal view; TW (width between tegulae): the greatest width between out-margin of tegulae in dorsal view; T1, T2 etc. for first, second, etc. metasomal terga; S1, S2, etc. for first, second, etc. metasomal sterna; punctation density is expressed as the

11.	Punctuation on disc of T1 extremely dense ($i=0.5-1.0d$) (Fig. 29e); apical hair band on T2 marrow, about 1/6 width as that of the related exposed terga (Fig. 29d)	<i>Colletes yanruae</i> sp. n.	12
-.	Punctuation on disc of T1 sparse ($i=1.0-1.5d$); apical hair band on T2 broad		
12.	Apical hair bands yellowish white, apical hair band on T2 about 1/3 wide medially as exposed T2 (Fig. 15f); head as in Fig. 15e.	<i>Colletes floralis</i> Eversmann	
-.	Apical hair bands white, apical hair band on T2 about 1/4 wide medially as exposed T2 (Figs. 22d, 22e); head as in Fig. 22b	<i>Colletes harreroides</i> sp. n.	
13.	Clypeus obviously longer than broad, malar area medially nearly 1.5 times long as width of mandible base (Fig. 17a)		
-.	Clypeus broader than long or as long as broad, malar area medially not longer than width of mandible base (Figs. 15a, 15c, 16a, 16e, 17c, 17e, 18c, 24b, 25b, 28b)	<i>Colletes haubrugei</i> Kuhlmann	14
14.	Apical hair band on T2 narrow, only 1/4-1/7 wide medially as exposed T2 (Figs. 16f, 18d, 24d)		15
-.	Apical hair band on T2 broad, nearly 1/2-1/3 wide medially as exposed T2 (Figs. 15b, 15d, 16b, 17d, 17f, 25d, 28d)		17
15.	Apical hair band on T2 extremely narrow, merely 1/7 wide medially as exposed T2 (Fig. 24d)	<i>Colletes heilongtanensis</i> sp. n.	
-.	Apical hair band on T2 wider, about 1/4 wide medially as exposed T2 (Figs. 16f, 18d)		16
16.	Antennal flagellum ventrally dark brown (Fig. 18c); disc of T1 with very dense punctuation ($i=0.5d$) of well defined round punctures (Fig. 18d)	<i>Colletes jankowskyi</i> Radoszkowski	
-.	Antennal flagellum ventrally black (Fig. 16e); disc of T1 with more dispersed punctuation ($i=1.0-1.5d$) of irregularly shaped punctures (Fig. 16f)	<i>Colletes harreri</i> Kuhlmann	
17.	Punctuation on clypeus dense (Fig. 15a, 17c, 28b)		18
-.	Punctuation on clypeus dispersed (Figs. 15c, 16a, 17e, 25b)		20
18.	Malar area medially longer than width of mandible base (Fig. 17c)	<i>Colletes hedini</i> Kuhlmann	
-.	Malar area medially not longer than width of mandible base (Figs. 15a, 28b)		19
19.	Apical hair band on T1 interrupted broadly (Fig. 28e); punctuation on disc of T more dispersed (Fig. 28e); head as in Fig. 28b	<i>Colletes xuezhongi</i> sp. n.	
-.	Apical hair band on T1 interrupted narrowly (Fig. 15b); Punctuation on disc of T1 denser (Fig. 15b); head as in Fig. 15a.	<i>Colletes cinerascens</i> Morawitz	
20.	Apical hair band uninterrupted medially (Figs. 25d, 25e)	<i>Colletes hirsutus</i> sp. n.	
-.	Apical hair band interrupted medially (Figs. 15d, 16b, 17f)		21
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-.	Clypeus sparsely punctuate, dull (Fig. 16a)	<i>Colletes friesei</i> Cockerell	
22.	Lateral hair patch on T1 large, apical hair band and basal hair band on T2 wider (Fig. 15d); head as in Fig. 15c	<i>Colletes clypearis</i> Morawitz	
-.	Lateral hair patch on T1 small, apical hair band and basal hair band on T2 narrower (Fig. 17f); head as in Fig. 17e.	<i>Colletes himalayensis</i> Kuhlmann	

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