CORRESPONDENCE

The species of the snakefly genus *Xanthostigma* (Raphidioptera: Raphidiidae) from China

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Abstract The order Raphidioptera, particularly the family Raphidiidae, is a rare insect group from China. In the present paper, *Xanthostigma xanthostigma* (Schummel, 1832) of Raphidiidae is newly recorded in China. The Chinese species of the genus *Xanthostigma* are redescribed and illustrated, with updated information of their geographical distributions.

Key words Raphidioptera, Raphidiidae, *Xanthostigma*, snakefly, China.

Raphidioptera (snakeflies) is a distinctive, minor holometabolous insect order in the superorder Neuroptera, and the adults are distinguished by the prognathous head, the narrowly elongate prothorax, and the elongate female ovipositor. Extant snakeflies consist of 33 genera and ca. 240 species, all of which are placed in two families, Raphidiidae and Inocelliidae (Haring et al., 2011; Aspöck et al., 2012). China is a vast territory comprising large areas with apparently excellent ecological conditions for snakeflies. However, there are only 30 described snakefly species sorted in three genera of Inocelliidae and two of Raphidiidae (Liu, unpublished data). Compared with the Chinese fauna of Inocelliidae, the fauna of Raphidiidae are much fewer in China, with only 10 species, six of which are distributed in mainland China but the remaining four are endemic to Taiwan (Liu et al., 2011a, b). Among the Chinese raphidiid species, nine species belong to the genus *Mongoloraphidia* Aspöck & Aspöck, 1968 (about 60 species in the world), while the other one belongs to the genus *Xanthostigma* Navás, 1909 (only five species in the world) (Aspöck & Aspöck, 1990; Aspöck et al., 1991, 1998; Liu et al., 2011a, b). Despite the recent revision of the Chinese species of *Mongoloraphidia* (Liu et al., 2011a, b), the taxonomy of the *Xanthostigma* species from China is still poorly studied. In this paper, we discover *Xanthostigma xanthostigma* (Schummel, 1832) from Xinjiang, China for the first time. Redescription of the two *Xanthostigma* hitherto known species from China is provided, with new data on their geographical distribution.

Specimens for the present study were deposited in the Entomological Museum of China Agricultural University (CAU), Beijing; the Institute of Zoology, Chinese Academy of Science (IZCAS), Beijing; the insect collection of Zhejiang University (ZJU), Hangzhou; and the insect collection of Central South University of Forestry and Technology (CSUFT), Changsha. Preparations of the genital segments were made by clearing the apex of the abdomen in a cold, saturated KOH solution for 6–8 hours. After rinsing the KOH with acetic acid and water, the apex of the abdomen was transferred to glycerin for further dissection and examination. The terminology of the genitalia generally follows that of Aspöck et al. (1991) and Aspöck & Aspöck (2008).

*Xanthostigma* Navás, 1909

*Xanthostigma* Navás, 1909: 145. Type species: *Raphidia xanthostigma* Schummel, 1832: 12 (absolute tautonomy).


Generic diagnosis. Snakeflies of medium-sized (male forewing length 7.5 mm on average). Head ovoid, posteriorly tapering, black, slightly shiny. Pronotum slender, nearly as long as head. Wings transparent, pterostigma elongate, about 3.0 times as long as wide, unicolored. Forewing Rs distally with 3–4 branches; MA mostly bifurcated; MA with 4 distal forks. Abdomen dark, with yellowish markings. Male tergite 9 much longer than tergite 8; sternite 9 paired as tiny sclerites; gonocoxite 9 broad, posteriorly directed; gonostylus 9 slenderly elongate, terminally usually forked; hypovalva generally slenderly elongate; parameres and gonarcus feebly developed; ectoproct broad, strongly broadened posteriad and expanded.

Figures 1–2. Habitus of *Xanthostigma* spp. from China. 1. *X. gobicola*, male from Hebei. 2. *X. xanthostigma*, male from Xinjiang. Scale bars = 1.0 mm.
ventrad. Female bursa copulatrix with glandulae receptaculi bearing bulbs on each short thread-like stalk.

Distribution. Widely distributed in Palaearctic Region.

*Xanthostigma gobicola* U. Aspöck & H. Aspöck, 1990 (Figs 1, 3–8)


Male. Body length 8.1–9.8 mm; forewing length 6.9–7.2 mm, hindwing length 6.2–6.6 mm.

Head (Fig. 1) ovoid, posteriorly tapering, black, slightly shiny blonde green; vertex with three indistinct reddish brown longitudinal stripes at middle and lateral margins; clypeus pale brown, medially with a yellow subtriangular marking. Compound eyes grayish brown. Antennal sclerite yellow; antennae yellow, but flagellum pale brown except for proximal 6-8 flagellomeres yellow. Mouthparts yellow; mandibles with distal half pale brown, maxillary and labial palpi blackish brown.

Pronotum (Fig. 1) long, slender, dark brown, respectively with a yellowish brown stripes on anteromedial and posteromedial portions, and posteriorly with a pair of yellowish longitudinal stripes near lateral margins; meso- and metathorax blackish brown, mesonotum medially with a yellow subtriangular marking on anterior margin and with scutellum yellow, metanotum with only scutellum yellow. Legs yellow with brownish setae, distal two tarsomeres blackish
brown. Wings hyaline; pterostigma pale yellow, medially crossed by a short oblique veinlet; veins blackish brown, proximal half of C and R veins yellow. Rs trifurcated distad.

Abdomen (Fig. 1) blackish brown; all pregenital segments dorsally with a pair of yellowish vittae laterally and with a yellowish vitta centrally; each sternum with a transverse yellowish marking posteriorly. Genital segments blackish brown, tergite 9 with yellowish markings on posteromedial and lateral margins, ectoproct laterally with yellowish markings. Tergite 9 (Fig. 3) in lateral view nearly rectangular, in dorsal view with arcuate lateral margins and posterior incision. Sternite 9 present as a pair of tiny, slender sclerites. Gonocoxite 9 (Fig. 5) longitudinally directed, nearly as long as tergite 9, about 2.5 times as long as wide, ventral margin without claw-like process or dentation; gonostylus 9 elongate, slightly and arcuately incurved, terminally bearing two short, hook-like processes. Hypovalva (Fig. 4) about 2/3 length of tergite 9, anterior portion laterally extending into an arcuate beam, remaining part narrowly blade-like. Paramere (Fig. 5) narrow, located at dorsal

Figures 5–8. Xanthostigma gobicola Aspöck & Aspöck. 5. Male genital segments, lateral view. 6. Female genital segments, lateral view. 7. Female sternite, ventral view; 8. Atrium bursae, dorsal view. Abbreviation. T&S7–9, tergite and sternite 7–9; e, ectoproct; gx9, gonocoxite 9; hv, hypovalva (= gonapophyses 9); ep, endophallus; gst 9, gonostylus 9; o, ovipositor. Scale bars = 0.5 mm.
portion of base of endophallus, with dense tiny dentation. Gonarcus absent. Endophallus (Fig. 5) slightly longer than tergite 9. Ectoproct (Figs 3, 5) broad, anteriorly with an arcuate transverse suture, and strongly expanded posteroventrad, forming subtrapezoidal posterior incision in dorsal view.

Female. Body length with ovipositor 11.6–14.6 mm, body length without ovipositor 8.1–11.4 mm; forewing length 7.7–9.9 mm, hindwing length 7.1–7.9 mm.

Sternite 7 (Figs 6–7) subtrapezoidal in lateral view and nearly rectangular in ventral view, with truncate posterior margin. Tergite 8 with nearly truncate anterior margin and arcuate posteroventral margin in lateral view. No subgenitale discernible. Ectoproct in lateral view nearly rectangular, slightly wider than long. Atrium bursae (Fig. 8) richly pleated, margin. Tergite 8 with nearly truncate anterior margin and arcuate posteroventral margin in lateral view. No subgenitale segment 7 and narrowed anteriorly; receptaculum seminis (Fig. 6) slightly shorter than sacculus bursae, distally globally broadened; glandulae receptaculi (Fig. 6) distally with two bulbs on each short thread-like stalk.

Material examined. CHINA: 1♂, Beijing, Mentougou, Baitianshan, 1 200 m, 30 June 2005, Mingxia Sun (CAU); 4♀, Beijing, Mentougou, Baitianshan, 1 200 m, 30 May 1973, Yongshan Shi (IZCAS); 2♂, Beijing, Mentougou, Xiaowutaishan, 19 June 1988, Weiwei Zhang (CAU); 1♀, Beijing, Mentougou, Xiaowutaishan, 14 July 2005, Kuiyan Zhang (CAU); 1♂, Beijing, Mentougou, Longmenjian, 3 June 2004, Weihai Li (CAU); 2♀, Beijing, Mentougou, Longmenjian, 3 June 2004, Xingyue Liu (CAU); 1♂, Beijing, Mentougou, Longmenjian, Guigu, 4 June 2004, Xingyue Liu (CAU); 1♀, Beijing, Mentougou, Xiaowutaishan, 8 June 2004 (CAU); 1♀, Beijing, Mentougou, Xiaowutaishan, 9 July 2011, Ulrike Aspöck (CAU); 1♂, Beijing, Yanqing, Songshan, Feng Yuan (CAU); 2♀, Beijing, Yanqing, Songshan, 850 m, 14 July 2003, Xunan Shan (CAU); 6♀, Beijing, Miyun, Pottolinchang, 23 May 2004, Feng Yuan (CAU); 1♀, Beijing, Changping, Huyu, 22 May 2011, Xingyue Liu (CAU); 5♀, Beijing, Yanqing, Songshan, 2/3 June 2010 (CAU); 2♂, Hebei, Yuxian, Xiaowutaishan, 29 June 2005, Xingyue Liu (CAU); 3♂2♀, Hebei, Yuxian, Xiaowutaishan, 29 June 2005, Hongxia Liu (CAU); 2♂, Hebei, Yuxian, Xiaowutaishan, Jinhekougou, 1 June 2004, Xingyue Liu (CAU); 2♀, Hebei, Yuxian, Xiaowutaishan, 1 200 m, 26/27 July 2000, Yue Zhang & Peng Wang (CSUFT); 2♂♀, Hebei, Yuxian, Xiaowutaishan, Jinhekougou, 29 June 2004, Xingyue Liu (CAU); 1♂2♀, Hebei, Yuxian, Xiaowutaishan, Jinhekougou, 1 June 2004, Xingyue Liu (CAU); 3♂1♀, Hebei, Yuxian, Xiaowutaishan, 29 June 2005, Hui Dong (CAU); 1♂, Hebei, Zhuolu, Yangjiaping, 3 July 2005, Xingyue Liu (CAU); 1♂, Hebei, Chengde, Wulingshan, Dujianfeng, 7 July 2008, Yan Li (CAU); 1♂2♀, Hebei, Chengde, Wulingshan, Dagou, 23 May 2013, Wei Zhang (CAU); 2♀, Ningxia, Helanshan, Xiaokouzi, 27 May 1987 (CAU); 1♀, Ningxia, Helanshan, Suyukou, 2000 m, 4 July 2007, Gang Yao (CAU); 1♂, Neimenggu, Helanshan, Beisi, 2000 m, 7 July 2007, Gang Yao (CAU); 1♀, Neimenggu, Helanshan, Beisi, 5 September 1990 (CAU); 1♀, Neimenggu, Helanshan, Nansi, 3 200 m, 29 July 2013, Xiumei Lu (CAU); 1♀, Neimenggu, Helanshan, Halawumigou, 2 244 m, 30 July 2010, Meiyin Lin (CAU); 1♀, Neimenggu, Helanshan, Xuelingzi, Nansi, 2 160 m, 29 July 2010, Aimin Shi & Guangyu Zhao (CAU); 1♀, Neimenggu, Saihanwula, Zhenggou, 1 200 m, 23 July 2013, Xiumei Lu (CAU); 1♂, Shanxi, Huashan, 1963, Io Chou (CAU); 1♀, Shanxi, Ganquan, Qingquan, 26 June 1971, Chikun Yang (CAU); 1♂, Yuhianghien, 18 May 1916 (CAU); 1♀, Yaot’eou, 6 June 1916, Matindife Navin (CAU).

Distribution. China (Beijing, Hebei, Shanxi, Shaanxi, Ningxia, Neimenggu); Mongolia.

_Xanthostigma xanthostigma_ (Schummel, 1832)  New record from China  (Figs 2, 9–11)

_Raphidia xanthostigma_ Schummel, 1832: 12. Type locality: Poland (Wroclaw: Breslau).


_Raphidia chalybocephala_ Ratzeburg, 1844: 254. Type locality: unknown.

_Raphidia schummelii_ Girard, 1864: 673. Type locality: France (Maisons-Laffitte).

_Raphidilla germanica_ Steinmann, 1964: 222. Type locality: unknown.

_Raphidilla rapax_ Steinmann, 1964: 218. Type locality: unknown.

_Agulla trilobata_ Bartoš, 1965a: 87. Type locality: Czech Republic (Jihomoravský: steppe near Pouzdřany).

_Agulla rostrata_ Bartoš, 1965b: 458. Type locality: Moldova.

Male. Body length 9.6 mm; forewing length 8.0 mm, hindwing length 7.4 mm.

Head (Fig. 2) ovoid, posteriorly tapering, black, slightly shiny blonde green; vertex medially with an indistinct reddish brown longitudinal stripe; clypeus yellow. Compound eyes grayish brown. Antennal sclerite yellow; antennae yellow, but flagellum with distal half pale brown. Mouthparts yellow; mandibles with distal half reddish brown.

Pronotum (Fig. 2) long, slender, yellow, laterally with a pair of brownish longitudinal stripes; meso- and metathorax blackish brown, mesonotum medially yellow, metanotum with posterior margin of scutellum yellow. Legs yellow with yellowish long setae and brownish short setae. Wings hyaline; pterostigma pale yellow, medially crossed by a short oblique veinlet; veins brown, but longitudinal veins with proximal half yellow. Rs trifurcated distad.
Abdomen (Fig. 2) blackish brown; all pregenital segments dorsally with a pair of yellowish vittae laterally and with a yellowish vitta centrally, yellow markings on terga 4–6 much larger; each sternum with posterior margin slightly yellow, and sterna 6–8 almost entirely yellow. Genital segments blackish brown, tergite 9 and ectoproct laterally with yellow markings. Tergite 9 (Fig. 9) in lateral view nearly subtrapezoidal, in dorsal view with arcuately convex lateral margins and arcuately concaved posterior margin. Sternite 9 (Fig. 10) present as a pair of tiny, slender sclerites. Gonocoxite 9 (Fig. 11)

longitudinally directed, nearly as long as tergite 9, about 2.5 times as long as wide, ventral margin with rows of dentation and medially with a laterally curved claw-like projection; gonostyulus 9 elongate, slightly and arcuately incurved, terminally bearing a long spiny process and a short dentate process. Hypovalva (Fig. 10) about 2/3 length of tergite 9, anterior portion deeply V-shaped, laterally with a pair of short subtriangular projections, remaining part slightly broaden posteriori, with rounded tip. Paramere (Fig. 9) short and broad, located at dorsal portion of base of endophallus, in lateral view comma-shaped, in dorsal view arcuate posterior incision. Gonarcus (Fig. 11) paired, slender, laterally curved. Endophallus (Fig. 11) slightly longer than tergite 9, bilobed distad, proximally with a pair of foliate sclerites, which bear rows of dentation. Ectoproct (Figs 9–10) broad, anteriorly with an arcuate transverse suture, and strongly expanded ventrad, forming arcuate posterior incision in dorsal view.

Material examined. 1 ♂, China, Xinjiang, Beitun, 6 May 1963 (ZJU).

Distribution. China (Xinjiang); Iran, Mongolia; Austria, Bulgaria, Croatia, Czech, Denmark, Finland, Germany, Hungary, Liechtenstein, Moldova, Netherlands, Norway, Poland, United Kingdom, Slovakia, Slovenia, Romania, Russia, Switzerland.

Discussion

Although the two Xanthostigma species presently redescribed are very similar in appearance, they can be distinguished based on the male genitalia. In X. gobicola the male gonocoxite 9 has smooth ventral margin, the hypovalva laterally extends into an arcuate beam on anterior portion but narrowly blade-like on posterior portion, the parameres are narrow sclerites with dense tiny dentation, and the gonarcus is absent. In X. xanthostigma the male gonocoxite 9 bears rows of dentation and a laterally curved claw-like projection on ventral margin, the hypovalva is deeply V-shaped on anterior portion and slightly broaden posteriori with rounded tip, the parameres fuses as a short and broad sclerite, which is in lateral view comma-shaped, and the gonarcus is present as a paired, slender, laterally curved sclerites.

Xanthostigma xanthostigma is a widely distributed and common snakefly species in the Palaearctic region. However, the distribution range of X. xanthostigma seems to be more western and northern than the range of X. gobicola. In China X. gobicola is much more common and widespread than X. xanthostigma which is presently restricted to Xinjiang in northwestern China. The areas adjacent to western China, such as northwestern India, central Asia, etc., have diverse fauna of Raphidiidae (Aspöck et al., 1991). Therefore, the western China presently with only one snakefly species indeed represents an open area for Raphidioptera, probably with more species to be discovered.

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References


