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A new species of *Meligethes* Stephens from China and additional data on members of the *M. chinensis* species-complex (Coleoptera: Nitidulidae, Meligethinae)

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Abstract
Meligethes (*Odontogethes*) *inexpectatus* **sp. n.** is described from China, Sichuan Province. The new species is based on a female specimen previously incorrectly referred to as *Meligethes scrobescens* Chen, Lin, Huang & Yang, 2015, which was recently described from a series of male specimens collected in the same area. Both species belong to the taxonomically difficult species-group related to *M. chinensis* Kirejtshuk, 1979, including a dozen closely related species distributed throughout Nepal and SW and Central China. The true female of *Meligethes scrobescens* is also described, based on recently collected material from China (Hubei and Chongqing), including a series of male and female specimens. Diagnostic characters distinguishing the new species from all other known members of the *M. chinensis* species-group and species-complex are discussed, and their overall range distribution are depicted. Additional data on geographic distribution and larval ecology of some of the closely related species are also reported.

Keywords: taxonomy, distribution, host-plants, pollen beetles, cryptic species.

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Introduction

The genus *Meligethes* (Coleoptera: Nitidulidae, Meligethinae), established by Stephens in 1830, as re-defined and delimited by Audisio et al. (2009, 2014) and Trizzino et al. (2009), was recently revised by Audisio et al. (2015). This genus includes some sixty species, mostly distributed in the Eastern portion of the Palaearctic Region, and all are associated with flowers of Rosaceae. Five additional new species from China were recently described by Chen et al. (2015) and by Liu et al. (2016). An interactive key for the identification of all known species is currently in press (Scaramuzzi et al. 2017).

This paper is focused on the description of a new species from China, Northern Sichuan, based on a female specimen previously erroneously attributed by Liu et al. (2016) to the closely related *Meligethes scrobescens* Chen, Lin, Huang & Yang, 2015 (also known from Sichuan). The new species is a member of a clade (the *Meligethes chinensis* Kirejtshuk, 1979 species group). An integrative taxonomy approach (see, e.g., Audisio et al. 1999, 2000, 2001a, 2001b, 2002, 2006, 2011, 2012, De Biase et al. 2003; Mancini et al. 2016) is needed to fully illuminate the relationships involving the constituent species (all from China and neighboring countries: Figs 4-5) thus far included in this problematic group. Eleven of the species (*M. chinensis*, *M. scrobescens*, *M. bourdilloni* Easton, 1968, *M. henan* Audisio, Sabatelli & Jelínek, 2015, *M. pseudochinensis* Audisio, Sabatelli & Jelínek, 2015, *M. inexpectatus* sp. n., *M. luteoornatus* Audisio, Sabatelli & Jelínek, 2015, *M. brassicogethoides* Audisio, Sabatelli & Jelínek, 2015, *M. occultus* Audisio, Sabatelli & Jelínek, 2015, *M. nigroaeneus* Audisio, Sabatelli & Jelínek, 2015, and *M. schuelkei* Audisio, Sabatelli & Jelínek, 2015) form the *M. chinensis* complex, including a series of cryptic or nearly cryptic species, while the remaining two (*M. pallidoelytrorum* Chen & Kirejtshuk, 2013, and *M. simulator* Audisio, Sabatelli & Jelínek, 2015), form the *M. pallidoelytrorum* species complex (see Audisio et al. 2015 and Figs 4-5 herein).

Abbreviations

Acronyms used in morphological measurements: refer to Fig. 3 and Table 1 in Audisio et al. (2015).
Acronyms of museal institutions:
ARCC – A.R. Cline's collection, currently housed in the

Plant Pest Diagnostics Center in Sacramento, California, USA
BMNH – Natural History Museum, London
CAR-MZUR – P. Audisio's collection, currently housed in the Zoological Museum, Sapienza Rome University, Rome, Italy
CAS – California Academy of Sciences, Sacramento, USA
NMPC – National Museum, Prague, Czech Republic
NWAU – Entomological Museum of the Northwest A&F University, Yangling, China

***Meligethes* (*Odontogethes*) *inexpectatus* sp. n.**
(Figs 3c, 4)
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Diagnosis. Oval convex medium-sized body, similar in external shape and color to the widespread and commonly collected *Meligethes chinensis* Kirejtshuk, 1979, with dorsal surface diffusely punctate, and smooth and shining interspaces; elytra without distinguishable traces of transverse strigosity. Nut brown, prosternum and peripheral margins of pronotum brown-yellow, legs and antennae orange, antennal club dark. Ovipositor large and well-sclerotized, peculiarly shaped distal region (Fig. 3c), exhibiting a minutely bifid apex, and slightly widened prior to apex. This shape is unique in the species complex and the whole genus (Figs 3a-k). Male genitalia unknown.

Description
Size: body length 2.9 mm, width 1.5 mm.
Body color and pubescence: uniformly nut brown, shiny, lateral sides of pronotum lighter, cream colored. Head and antennae yellowish, antennal club brown. Pubescence normal, golden to whitish, rather short, not concealing tegument.
Dorsal habitus: Body shape nearly as in *Meligethes chinensis* (Fig. 21c in Audisio et al. 2015). Clypeus with truncate anterior margin. Ratio LPR1/LELY = 0.47; ratio WPR1/LPR1 =1.86; ratio WPR2/LPR1 = 1.91; ratio WPR2/WPR1 = 1.02; ratio LELY/WELY = 1.00; ratio WPR1/WPRA = 1.69; ratio WPR1/WELY = 0.88; ratio WPR2/WELY = 0.96.
Ventral habitus: mediolongitudinal ridge of mesoventrite bluntly carinate, carina reaching posterior margin of mesoventrite. Metaventrite (female) flattened posterior to midlength, mediolongitudinal line indistinctly impressed.
Appendages: Antennae relatively short; ratio ANLE/HWEA = 0.75; ratio CLLE/W10J = 1.28; ratio L03J/W03J = 2.1; ratio L03J/L02J = 0.90; ratio L03J/L04J = 1.50; ratio WFTA/LFTA = 0.33; ratio LETI/WITI = 3.50.
Female genitalia (ovipositor): The ovipositor is peculiarly shaped (Fig. 3c), with apex rather sharply narrowed, the subapical portion being abruptly widened and bearing a minute but distinct U-shaped excision distad. This characteristic is curiously similar to the shape of ovipositors known in certain anthophagous W-Asiatic species of the genus *Brachyleptus* Motschulsky, 1845 (Kateretidae; Audisio 1989, 1993). Ratio STLE/DSIA ≈ 0.14; ratio STLE/CGOW ≈ 0.05; ratio GONL/CGOW ≈ 1.75. Basal portions of gonocoxites transverse, their laterally directed apices bluntly pointed. Ratio OVPL/GONL ≈ 2.41.
Male: unknown.

Material examined. Holotype, ♀: **China**: Sichuan, Jiuzhaigou Valley, Zhangzha, bushy area above the main road, 2150 m a.s.l., 33.16.16N, 103.53.46E, 22 Jul 2015, P.Audisio, M.Liu & M.Huang lgt (NWAU).

Distribution. **EPA**: Only known from Sichuan (Fig. 4).

Chorotype. SW Sinic.

Host-plants. Unknown; probably *Rubus* sp. or related Rosaceae, as for other *Meligethes* species.

Habitat. Locality data indicates that this species appears to prefer the edges of middle altitude sparsely forested areas. The female holotype has been collected by sweeping shrubs.

Phenology. **VII.** The only available specimen was collected at the end of July, which indicates adult activity at least from late May to August.

DNA data. Not available.

Etymology. The name of the new species is derived from the Latin *inexpectatus* (= unforeseen, unexpected) due to its unexpected discovery in the same region of SW China (NW Sichuan) where are also known to occur at least two other sympatric (in some cases even syntopic) cryptic species (*M. chinensis, M. scrobescens*) of the same species-complex, which are almost indistinguishable from each other based on external morphological characters.

Taxonomic remarks. As reported above, this new species is almost identical in external shape to *Meligethes chinensis* Kirejtshuk, 1979, and allied species (Audisio et al. 2015). The described female holotype was originally attributed (Liu et al. 2016) to *M. scrobescens* Chen, Lin, Huang & Yang, 2015, based on a series of male specimens collected in a few localities of SW Sichuan, including the Jiuzhaigou Valley where the new species was also found. Recently available (2016) additional material of both sexes of *M. scrobescens* from Hubei and Chongqing (see below) allowed us to discover that the female of this species, closely related to *M. chinensis*, exhibits an ovipositor closely resembling (as in Fig. 3a) that of the common and widespread *M. chinensis*, but strongly differing from the peculiarly shaped ovipositor of the new species (Fig. 3c). Therefore, there is no doubt about its specific designation.

***Meligethes* (*Odontogethes*) *scrobescens* Chen, Lin, Huang & Yang, 2015**

The true ovipositor of this species is almost identical to that of *M. chinensis* (as in Fig. 3a). Male genitalia as in Figs 1e, f.

Distribution. SW China; known thus far from Sichuan (Chen et al. 2015) and from Hubei, Chongqing (see the following unpublished data). **China**: Sichuan, Nanping, Jiuzhaigou, 2600 m a.s.l., 05 Sep 1983, H. Chai lgt; Sichuan, Nanping, Jiuzhaigou, 2550 m a.s.l., 05 Sep 1983, X. Zhang lgt; Sichuan, Gongga Shan, Yanzigou, 2500 m a.s.l., 08 Jun 1983, Y. Chen lgt; Sichuan, Wolong, Sanshenggou, 2500 m a.s.l., 06 Aug 1983, S. Wang lgt; Hubei, Badong, Tiechanghuang, 31.51.31N, 110.32.56E, 1237 m a.s.l., 08 Jun 2016, M. Liu lgt (NWAU, CAR-MZUR); Chongqing, Shizhu, Huangshui, 30.21.6N, 108.38.3E, 1560 m a.s.l., 10, 12 Jun 2016, M. Liu lgt (NWAU, CAR-MZUR, NMPC, CAS) (Fig. 4).

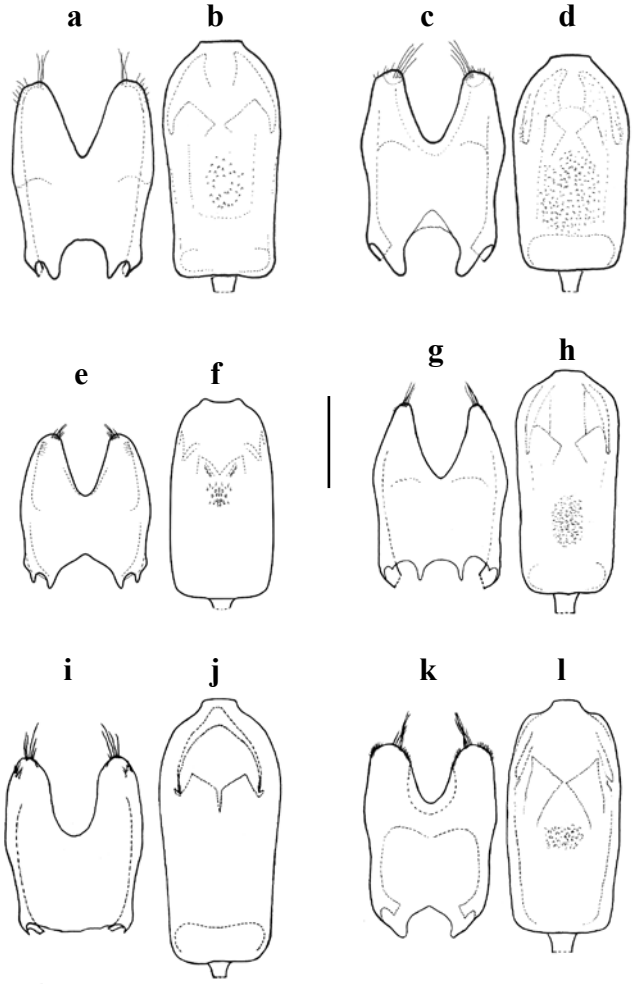

Fig. 1 − Male genitalia of *Meligethes* spp. (**a**, **c**, **e**, **g**, **i**, **k**, tegmen, dorsal view; **b**, **d**, **f**, **h**, **j**, **l**, median lobe of the aedeagus, dorsal view): **a**, **b**, *M. chinensis* Kirejtshuk, 1979; **c**, **d**, *M. bourdilloni* Easton, 1968; **e**, **f**, *M. scrobescens* Chen, Lin, Huang & Yang, 2015; **g**, **h**, *M. henan* Audisio, Sabatelli & Jelínek, 2015; **i**, **j**, *M. pseudochinensis* Audisio, Sabatelli & Jelínek, 2015; **k**, **l**, *M. luteoornatus* Audisio, Sabatelli & Jelínek, 2015. Scale bar: 0.2 mm.

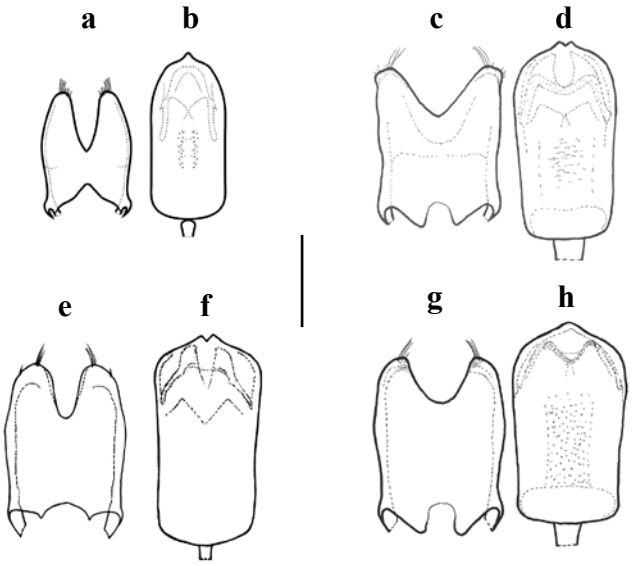

Fig. 2 − Male genitalia of *Meligethes* spp. (**a**, **c**, **e**, **g**, tegmen, dorsal view; **b**, **d, f**, **h**, median lobe of the aedeagus, dorsal view; **a**, **b**, *M. pallidoelytrorum* Chen & Kirejtshuk, 2013; **c**, **d**, *M. simulator* Audisio, Sabatelli & Jelínek, 2015; **e**, **f**, *M. schuelkei* Audisio, Sabatelli & Jelínek, 2015; **g**, **h**, *M. nigroaeneus* Audisio, Sabatelli & Jelínek, 2015. Scale bar: 0.2 mm.

Host-plants. Unknown; probably *Rubus* sp. or related Rosaceae.

Taxonomic remarks. This species represents the taxon most closely related to *M. chinensis* and *M. bourdilloni*, exhibiting an extremely similar ovipositor, and male genitalia only differing in a shorter tegmen (ratio LETE/WITE ca. 1.35-1.40 in *M. chinensis* and *M. bourdilloni*, ca. 1.25 in *M. scrobescens*: Figs 1a, 1c, 1e), and bearing slightly shorter terminal setae (ratio THLE/LETE = 0.12-0.14), and the median lobe of the aedeagus being slightly arcuately emarginated distad and on average shorter (LEAE/WIAE = 2.0-2.3 in *M. chinensis*, = 1.80-2.00 in *M. scrobescens*) (Figs 1b, 1d, 1f). There is currently no data to suggest if the widely sympatric cryptic species *M. chinensis* and *M. scrobescens* use different host plants as larvae.

***Meligethes* (*Odontogethes*) *chinensis* Kirejtshuk, 1979**

Ovipositor of this species as in Fig. 3a. Male genitalia as in Figs 1a, b.

Distribution. SW and central China; known from Sichuan (Kirejtshuk 1979), Yunnan, W Henan, W Hubei and Gansu (Audisio et al. 2015); here reported also from Tibet, Shaanxi and Chongqing (Fig. 4).

Host-plants. Adults and larvae on *Rubus* spp. (Rosaceae), chiefly on *R. parvifolius* L. and related species (Liu et al. unpublished data).

Taxonomic remarks. This species represents the most common and widespread taxon of its species-group, and also exhibits an apparently marked variation in body size, shape, pubescence, and color. This species is frequently sympatric with other species of the same complex. The specific distinction from *Meligethes bourdilloni* Easton, 1968 from Nepal (Easton 1968) requires additional fresh material from possible intermediate areas, to carry out molecular analyses aimed to estimate levels of genetic distinction between members of the whole *M. chinensis* complex.

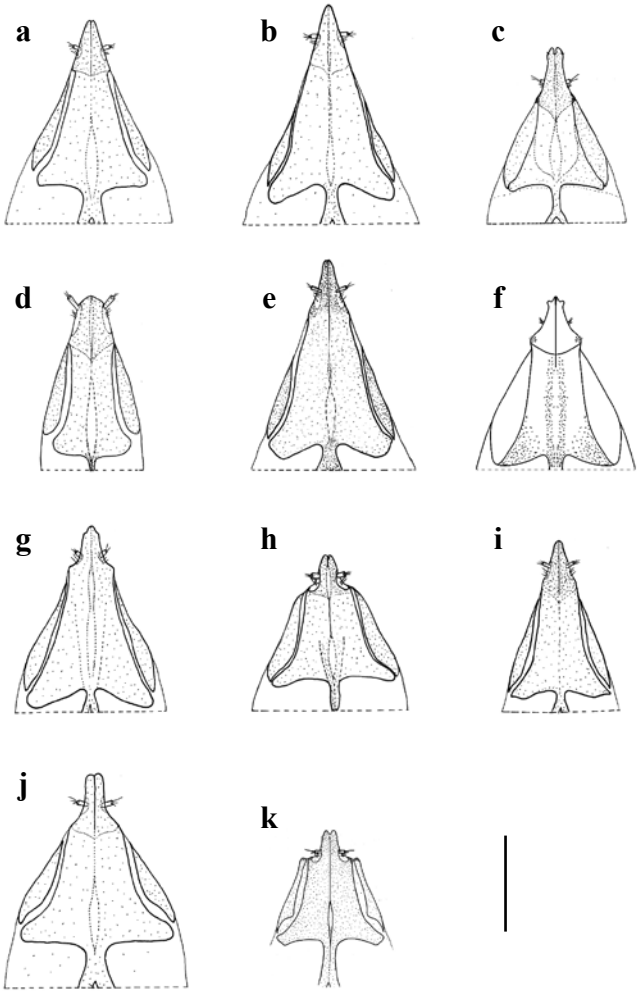

Fig. 3 − Female genitalia (distal portion of the ovipositor, from "central point" to apex) of *Meligethes* spp.: **a**, *M. chinensis* Kirejtshuk, 1979; **b**, *M. bourdilloni* Easton, 1968; **c**, *M. inexpectatus* sp. n. (female holotype); **d**, *M. pseudochinensis* Audisio, Sabatelli & Jelínek, 2015; **e**, *M. luteoornatus* Audisio, Sabatelli & Jelínek, 2015; **f**, *M. pallidoelytrorum* Chen & Kirejtshuk, 2013 (redrawn from Chen et al. 2013); **g**, *M. simulator* Audisio, Sabatelli & Jelínek, 2015; **h**, *M. schuelkei* Audisio, Sabatelli & Jelínek, 2015; **i,** *M. nigroaeneus* Audisio, Sabatelli & Jelínek, 2015; **j**, *M. brassicogethoides* Audisio, Sabatelli & Jelínek, 2015; **k**, *M. occultus* Audisio, Sabatelli & Jelínek, 2015. Scale bar: 0.2 mm.

***Meligethes* (*Odontogethes*) *henan* Audisio, Sabatelli & Jelínek, 2015**

The ovipositor of this species is almost identical to that of

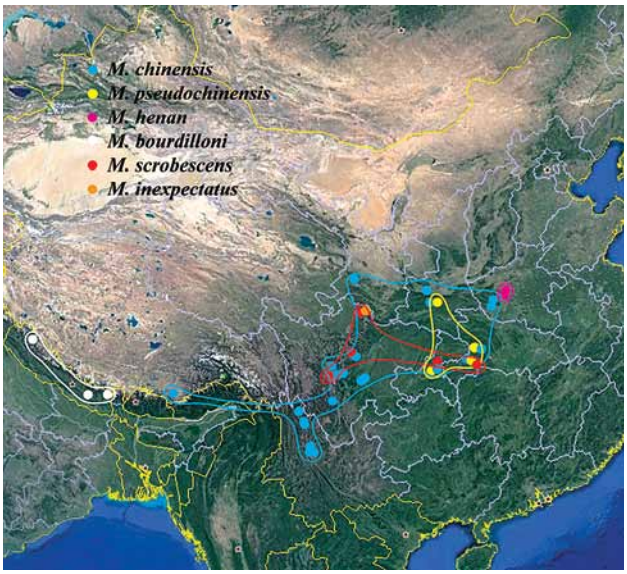

Fig. 4 – Distribution maps of *Meligethes* spp. (*M. chinensis*, *M. pseudochinensis*, *M. henan*, *M. bourdilloni*, *M. scrobescens*, and *M. inexpectatus* sp. n.).

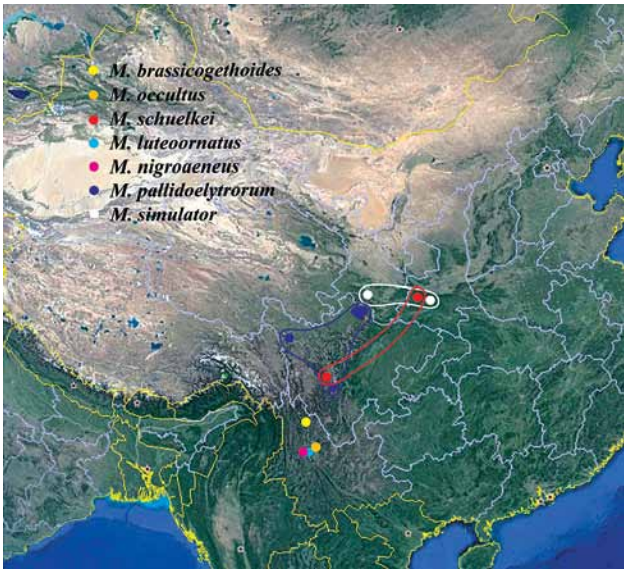

Fig. 5 − Distribution maps of *Meligethes* spp. (*M. brassicogethoides*, *M. occultus*, *M. schuelkei*, *M. luteoornatus*, *M. nigroaeneus*, *M. pallidoelytrorum*, and *M. simulator*).

Fig. 6 − The shrub *Pyracantha fortuneana* (Maximowicz) H. L. Li (Rosaceae) on which a series of adult specimens of *Meligethes pseudochinensis* have been collected in Chongqing (Photo by M. Liu).

M. chinensis (as in Fig. 3a). Male genitalia as in Figs 1g, h. **Distribution**. Central China; known thus far from Henan only (Audisio et al. 2015) (Fig. 4).

Host-plants. Unknown; probably *Rubus* sp. or related Rosaceae.

Taxonomic remarks. Despite its external similarity to *M. chinensis*, this species is well-characterized by its distinctive male genitalia, exhibiting markedly narrower paramere apices (Figs 1g, h). Female genitalia appear, on the contrary, very similar to both *M. chinensis* and *M. henan*. There is no available data to conclude whether these two partially sympatric cryptic species use different host plants as larvae.

***Meligethes* (*Odontogethes*) *pseudochinensis* Audisio, Sabatelli & Jelínek, 2015**

The ovipositor of this species is illustrated in Fig. 3d. Male genitalia as in Figs 1i, j.

Distribution. SW and central China; known thus far from Hubei (Audisio et al. 2015), but recently also collected in Shaanxi and Chongqing (see the following unpublished data). **China**: Hubei, road Badong-Yesanguan, Tiechanghuang, 30.75N, 110.03E, 1300 m, 27-28 Jun 2003, J. Turna lgt (CAR-MZUR, NM); Hubei, Shennongjia forest region, Muyu, 06 Jun 2016, M. Liu lgt (NWAU, CAR-MZUR); Chongqing, Shizhu, Huangshui, 30.21.6N, 108.38.3E, 1560 m a.s.l., 10-12 Jun 2016, M. Liu lgt (NWAU, CAR-MZUR, NMPC, ARCC, CAS); China, Shaanxi, Hanzhong, Foping, Xiongmao valley, Jul 2016, Z. Hui & Y. Yang lgt (NWAU, CAR-MZUR) (Fig. 4).

Host-plants. Conclusive specific host data remains somewhat problematic. Some adult specimens have been collected recently (see above: Chongqing, Shizhu, Huangshui, June 2016) on flowers of the shrub *Pyracantha fortuneana* (Maximowicz) H. L. Li (Rosaceae) (Fig. 6), which may represent the true larval host plant. Additional collecting events are needed that focus on obtaining larval material.

Taxonomic remarks. Despite its external similarity to *M. chinensis*, this species is well-characterized by distinctive male and female genitalia. No data is available to assess if these two partially sympatric cryptic species use different Rosaceae host plants as larvae. However, the above reported adult association of *M. chinensis* with *Rubus parvifolius* and of *M. pseudochinensis* with *Pyracantha fortuneana* represents an excellent initial clue to unravel the distinct host plant relationships of these taxa.

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