Zootaxa 3417: 45–52 (2012)
www.mapress.com/zootaxa/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

A review of *Micardia* Butler, 1878 from China (Lepidoptera, Noctuidae, Eustrotiinae)

FUQIANG CHEN[1] & DAYONG XUE[1, 2]

[1]*Key Laboratory of Zoological Systematics and Evolution, Institute of Zoology, Chinese Academy of Sciences, Beijing,100101, China. Email: chenfq@ioz.ac.cn, xuedy@ioz.ac.cn*
[2]*Corresponding author*

Abstract

Six species of the genus *Micardia* Butler, 1878 are recognized from China. Three new species, *M. pallens*, *M. distincta* and *M. minuta*, closely allied to *M. pulcherrima* (Moore, 1867), are described. The adults and the genitalia are illustrated for all examined species.

Key words: *Micardia*, Eustrotiinae, Noctuidae, Lepidoptera, new species

Introduction

The genus *Micardia* (type species *Micardia argentata* Butler, 1878) was erected by Butler (1878), and originally included the three species, *Micardia argentata* Butler, 1878, *Micardia pulchra* Butler, 1878 and *Micardia pulcherrima* (Moore, 1867). Later, five species of *Micardia* (*M. munda* Leech, 1900, *M. quqdrilinea* Scriba, 1921, *M. pulchrargentea* Bryk, 1942, *M. subobscura* Berio, 1973 and *M. simplicissima* Berio, 1973) were described from China, Japan, Russia (Kurile Isl.) and Myanmar (Leech 1900; Scriba 1921; Bryk 1942; Berio 1973). Among them, *M. pulchrargentea* Bryk, 1942 was synonymised with *M. pulchra* (Kononenko 1987, 2005) and the status of *M. quadrilinea* remained incertain. Berio (1954) and Viette (1982) described four species of *Micardia* from Madagascar, however their systematic position requires clarification. So far, eleven species of the genus *Micardia* reported by Poole (1989), including *M. pulchrargentea* as full species, but missing *M. subobscura*.

The genus is distributed predominantly from the south to the east of Asia and in Madagascar. Three species have been reported from China: *Micardia munda*, from Sichuan (Leech 1900); a male of *M. argentata* from Zhejiang (Hampson 1910); *M. pulcherrima* from Tibet and Sichuan (Chen 1982, 1999). In this paper, three new species closely allied to *M. pulcherrima* are described: *M. pallens* sp. nov., *M. distincta* sp. nov. and *M. minuta* sp. nov. The "*M. pulcherrima*" from Sichuan (Chen 1982, 1999) is revised and reidentified as *M. distincta* sp. nov. The brief diagnosis of the genus *Micardia* is provided.

Materials and Methods

The specimens examined are from the collection of the Institute of Zoology, Chinese Academy of Sciences (IZCAS). The types of the species *M. pulcherrima*, *M. argentata* and *M. munda* are revised by photos from Natural History Museum, London, UK (BMNH). The materials were mainly sampled by light traps. Photos of adults and genitalia were taken with a digital camera attached to a Zeiss Stereo Microscope and compiled with Auto-Montage software version 5.03.0061 (Synoptics Ltd). Wing venation terminology follows Comstock (1918) and Scoble (1992); external and genitalic terminology follow Nichols (1989), Klots (1970) and Chen (1999).

Accepted by L.F. Gall: 9 Jul. 2012; published: 10 Aug. 2012

Taxonomy

Micardia Butler, 1878

Micardia Butler, 1878, *Ann. Mag. Nat. Hist.*, (5)1: 81; Chen, 1999, *Fauna Sinica*, 16: 911. Type species: *Micardia argentata* Butler, 1878, by original designation.

Description. Head. Frons pale yellow to fuscous; antennae yellow, minutely ciliated in male; haustellum well developed; labial palpi upturned, reaching vertex, the second segment covered with long scales ventrally. Thorax. Yellow to fuscous dorsally; patagia and tegulae yellow, fuscous or pink. Legs yellow; midleg tibiae with a pair of spurs, hindlegs tibiae with two pairs of spurs. Venation. Forewing with Sc arising from base, R_1 from middle of upper margin of discal cell, R_{2-4} before upper angle of cell, R_3 and R_4 stalked in basal half, forming an areole with R_5 basally, R_5 and M_1 from upper angle of cell, M_2, M_3 and CuA_1 from lower angle of cell, CuA_2 arising from middle of ventral margin of cell, 1A+2A present. Hindwing with $Sc+R_1$ from base, Rs and M_1 from upper angle of cell, M_2, M_3 and CuA_1 from lower angle of cell, M_3 and CuA_1 stalked basally; CuA_2 from middle of ventral margin of cell. Wing pattern. Forewing with ground color yellow to fuscous; a white stripe usually present in discal cell, or on ventral margin of cell; a white oblique line usually from apex to middle of inner margin or incurved to base of forewing; underside similar to upside, but paler. Hindwing yellow to fuscous, discocellular spot and postmedial line present or absent; underside paler than upside. Abdomen. Pale yellow to fuscous. Male genitalia. Uncus slender and elongate, curved ventrally; base broadened; terminal half with dense long setae; tip pointed, sometimes an additional acute hook present on the tip. Tegumen trapezoidal, peniculus densely covered with long setae; vinculum almost as long as tegumen; saccus small, projecting dorsally. Valva usually asymmetric, variable, constricting towards apex; transtilla plate-like, extending towards uncus; harpe usually present or absent; costa and sacculus broad and strong. Juxta keeled, pyriform or oblong. Aedeagus moderate length, sclerotized ventrally; vesica with minute spines, ductus ejaculatorius arising from middle of aedeagus. Female genitalia. The eighth abdominal tergite broad, usually semicircular sclerotized; papillae anales near rectangular, densely covered with long setae; apophyses anterioris and posteriores short; ostium with sclerotized antrum; corpus bursae rounded, densely covered with minute spines inside; ductus seminalis minute, arising from base of corpus bursae.

Diagnosis. Both the genus and *Pseudodeltote* Ueda, 1984 differ from other *Deltote* generic group by sharing a deep groove on the lateral wall of tegumen (Ueda 1984, 1987). The former two genera are different from *Micardia* in having the reniform stigmata entirely absent on forewing.

Distribution. China, Russia (Kurile Isl.), Japan, Korea, India, Bhutan, Myanmar and Madagascar.

Remarks. The genus *Micardia* was placed by early authors to a heterogeneous assemblage Erastrianae (sensu Hampson 1910), later called Acontiinae (sensu auctorum). In the course of recent modifications of the classification of the Noctuidae this assmeblage has been divided into the subfamilies Acontiinae, Eustrotiinae, Boletobiinae, Aediinae, Metoponiinae and Sinocharinae, with some genera placed to Xyleninae (Speidel *et al.*1996; Fibiger & Lafontaine 2005; Lafontaine & Fibiger 2006; Holloway 2009, 2011; Lafontaine & Schmidt 2010; Zahiri *et al.* 2010, 2011). Ueda (1984, 1987) placed *Micardia* into *Deltote* group. Presently this group is considered as a core of the modern subfamily Eustrotiinae, and therefore we consider *Micardia* as a member of this subfamily.

Micardia pulcherrima (Moore, 1867)

Figs. 1–3, 10, 11

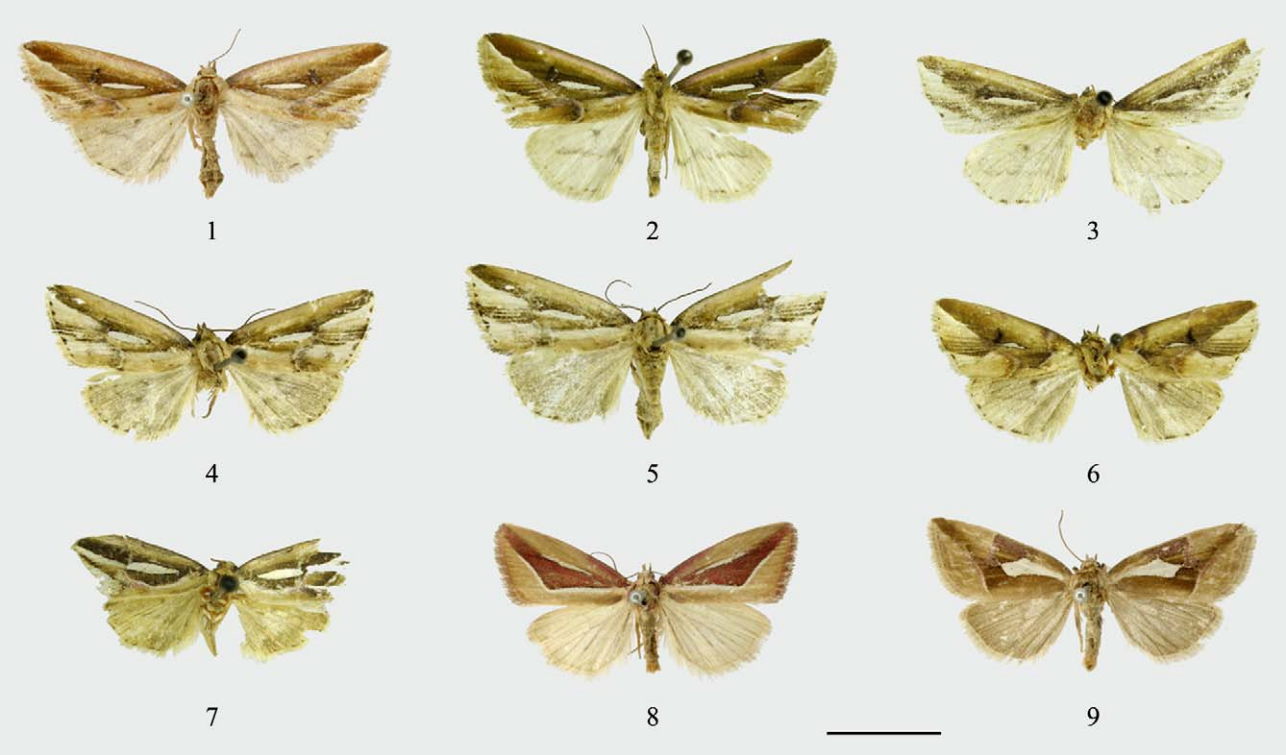
Leucania pulcherrima Moore, 1867, *Proc. Zool. Soc. Lond.*, 1867: 48, pl.6, fig.7. Type locality: [India]: [West Bengal], Darjeeling. [BMNH].

Eustrotia pulcherrima: Hampson, 1910, *Cat. Lep. Phal. Br. Mus.*, 10: 574; Chen, 1982, *Icon. Het. Sin.*, 3: 331 (part).

Micardia pulcherrima: Warren, 1913, *in* Seitz, *Macrolepid. World*, 11: 291, pl. 26 l; Chen, 1999, *Fauna Sinica*, 16: 912 (part).

Diagnosis. Externally, the species is close to *M. argentata* but differs by having the white stripe on forewing. The white stripe of *M. pulcherrima* is present on ventral margin of discal cell, while it covered most area of the cell in *M. argentata*. In the male genitalia, *M. pulcherrima* is closely allied to *M. pallens* sp. nov. and *M. minuta* sp. nov. It

differs from those species by an additional acute hook present on the tip of uncus; the valva has a finger-like harpe at the middle of costa and a tuberculiform process at the basal 1/4 of the sacculus.



FIGURES 1–9. Adults. 1–3. *Micardia pulcherrima*. 1, male, holotype (BMNH); 2, male (Gyirong, Tibet); 3, male (Cona, Tibet). 4–5. *M. pallens* sp. nov. 4, male, holotype; 5, female, paratype. 6, *M. distincta* sp. nov., male, holotype. 7, *M. minuta* sp. nov., male, holotype. 8, *M. munda*, male, holotype (BMNH). 9, *M. argentata*, male, holotype (BMNH). Scales: 1cm.

Material Examined. INDIA: Darjeeling, from Moore's collection, 1♂ (Holotype) (BMNH, photograph examined). CHINA, Tibet: Gyirong, 2800m, 18.VII.1975, coll. Wang Ziqing, 1♂ (Slide No.: Noct-00275); Cona, Mama, 2800, 6.VII.1974, coll. Huang Fusheng, 1♂ (Slide No.: Noct-00273) (IZCAS).

Distribution. China (Tibet), India, Bhutan.

Remarks. Two males, genitalia slides number Noct-00275 (Gyirong, Tibet) (Figs. 2, 10) and Noct-00273 (Cona, Tibet) (Figs. 3, 11), are examined. The specimen Noct-00273, in which the forewing is worn, looks slightly different from Noct-00275. In male genitalia, the right valva of Noct-00273 has the outer margin of apex slightly arc-shaped incurved, rather than smoothly straight in Noct-00275. We also compared both specimens to the holotype photos of *M. pulcherrima* (Fig. 1). There is only slight variation among them. Both specimens are from adjacent locations to the type locality of *M. pulcherrima* (Darjeeling, India). Consequently, both specimens should belong to *M. pulcherrima*.

Micardia pallens Chen & Xue, sp. nov.

Figs. 4, 5, 12, 15, 17

Description. Head. Frons fuscous, centrally yellowish brown; labial palpi upturned, fuscous on outer side, pale yellowish brown on inner side, slightly longer than diameter of eyes, second segment covered with long scales ventrally; antennae yellowish brown. Thorax. Yellow dorsally. Legs yellow except fuscous tarsi and spurs. Forewing length 14–16mm. Wing pattern. Base fuscous; costa yellowish brown, a pale orange longitudinal stripe between costa and vein Sc; a stick-like white stripe on terminal 2/5 of ventral margin of cell, discocellular fascia fuscous; a white oblique line arising below apex to middle of inner margin, terminal 1/4 crescentic; a pale yellow band along inner margin, divided into two parts by the crescent line, white above that band; outer area of the

oblique white line pale orange, mixed with dark grayish brown between M_2 and CuA_2, three pale orange longitudinal stripes and a wider white stripe between them; terminal line a series of dark grayish brown spots between veins; fringes pale yellowish brown, but dark grayish brown at apex, anal angle and between M_2 and M_3; underside fuscous, costal area yellow, apex and anal angle pale yellow. Hindwing. Ground color fuscous; discocellular spot and postmedial line slightly darker than ground color; terminal line a series of dark grayish brown spots between veins; fringes fuscous; underside pale yellow mixed fuscous scales, discocellular spot and indistinct postmedial line present. Abdomen. Pale yellow. Male genitalia. Uncus slender and elongate, curved ventrally; basally broadened; apical half with dense long setae dorsally; tip pointed, an additional acute hook present on the tip. Tegumen trapezoidal, peniculus densely covered with long setae; vinculum almost as long as tegumen; saccus small. Juxta pyriform. Valva asymmetric; transtilla plate-like, extending towards uncus; left valva wide basally, constricting towards apex, costa well developed, strongly sclerotized, harpe small, at middle of costa; sacculus well developed; right valva wide basally, terminal part expanded to auriform, then strongly constricted, a harpe at middle of costa, slightly larger than the left one. Aedeagus sclerotized ventrally; ductus ejaculatorius arising from middle of aedeagus. Female genitalia. The eighth abdominal tergite broad; the eighth abdominal sternite (Fig. 17) consists of two sclerotized plates, two processes densely covered with minute setae present inside on both sides; papillae anales nearly rectangular, densely covered with long setae; apophyses anteriores and posteriores short and strong, anteriores ones about 3/4 as long as posteriores; ostium funnel-like, with sclerotized antrum; ductus bursae tortuose and wrinkled, extremely shorter than the length of corpus bursae; corpus bursae kidney-shaped; ductus seminalis very thin, arising from base of corpus bursae.

Diagnosis. The species is closely allied to *M. pulcherrima*. On the forewing of *M. pallens*, a pale orange stripe is present between the costa and vein Sc; a white stripe is present on the terminal 2/5 of ventral margin of cell, while *M. pulcherrima* has a pink stripe between costa and Sc and a white stripe on the terminal half of ventral margin of cell. In the male genitalia, the new species has the left valva thinner than *M. pulcherrima*; the apical part of right valva of *M. pallens* is expanded to auriform, then strongly constricted. In addition, the harpe on both valva in *M. pallens* are shorter than that in *M. pulcherrima*, and the tuberculiform processes on both sacculus are indistinct.

Material Examined. Holotype, ♂ (Slide No.: Noct-00271), CHINA, Hubei: Badong, Tiechanghuang, 1.VIII.1981, coll. Li Wei (IZCAS). Paratype, 1♀ (Slide No.: Noct-00277), same data as holotype (IZCAS).

Distribution. China (Hubei).

Etymology. The specific name is derived from the Latin "*pallens*", corresponding to the pale orange longitudinal stripe on forewing.

Micardia distincta **Chen & Xue, sp. nov.**

Figs. 6, 13

Eustrotia pulcherrima (Moore), sensu Chen, 1982, *Icon. Het. Sin.*, 3: 331 (part misidentification).
Micardia pulcherrima (Moore), sensu Chen, 1999, *Fauna Sinica*, 16: 912 (part misidentification).

Description. Head. Frons pale yellowish brown, darker on both edges; labial palpi upturned, fuscous on outer side and pale yellowish brown on inner side, slightly longer than diameter of compound eyes, the second segment covered with long scales ventrally; antennae yellowish brown. Thorax. Dorsally, laterally and legs yellow. Forewing length 14mm. Wing pattern. Antemedial line straight arising from costa to ventral margin of cell, then outcurved to 1A+2A, incurved to inner margin at last; the posterior basal area pale yellow; a pale yellow longitudinal stripe present between costa and vein Sc; a triangular white stripe on terminal 2/5 of ventral margin of cell; discocellular fascia fuscous, crescentic; a white oblique line arising from apex to middle of inner margin, terminal half covered with pink scales, terminal 1/4 crescentic; outer area of the oblique line pale yellow, but fuscous between M_2 and CuA_2, three pale yellow longitudinal stripes between them; terminal line a series of dark grayish brown spots between veins; fringes pale yellow, but fuscous between M_2 and CuA_2; underside mostly area fuscous, except for pale yellow apex and anal angle. Hindwing. Ground color fuscous; discocellular spot and postmedial line indistinct; terminal line a series of dark grayish brown spots between veins; fringes fuscous; underside pale yellow mixed with fuscous scales, discocellular spot present; postmedial line indistinct. Abdomen. Yellow. Male genitalia. Uncus slender and elongate, curved ventrally; base broadened; terminal half with dense

long setae dorsally; tip sharply pointed. Tegumen trapezoidal, peniculus densely covered with long setae; vinculum almost as long as tegumen; saccus small, projecting dorsally. Juxta pyriform. Valva asymmetric; transtilla plate-like, extending towards uncus; left valva with base wide, constricting toward apex, apex bifid, costa well developed, strongly sclerotized, a small finger-like harpe present at middle of costa, sacculus well developed, a tuberculiform process present at basal 1/4; right valva obviously broader than left one, with slightly bifurcated apex. Aedeagus sclerotized ventrally; ductus ejaculatorius arising from middle of aedeagus. Female genitalia. Unknown.

Diagnosis. The species is close to *M. pulcherrima*, but differs by the presence of distinct antemedial line on forewing and a triangular white stripe on the terminal 2/5 of ventral margin of cell. In the male genitalia, the tip of uncus does not have the additional acute hook as in *M. pulcherrima*; the left valva is bifid apically, right valva apex is slightly bifurcated.

Material Examined. Holotype, ♂ (Slide No.: Noct-00272), CHINA, Sichuan: Mt. Emei, Jiulaodong, 1800–1900m, 31.VII.1957, coll. Lu Youcai (IZCAS). Paratype, 1♂, Sichuan: Mt. Emei, Jiulaodong, 1800–1900m, 28.VII.1957, coll. Huang Keren (IZCAS).

Distribution. China (Sichuan).

Etymology. The specific name is derived from the Latin "*distinct*", corresponding to the distinct antemedial line on forewing.

***Micardia minuta* Chen & Xue, sp. nov.**

Figs. 7, 14

Description. Head. Frons fuscous; antennae yellowish brown. Thorax. Dorsally, laterally and legs yellow. Forewing length 13mm. Wing pattern. Costa fuscous, a pink longitudinal stripe between costa and vein Sc, yellow scales, then fuscous, present below that stripe; a strong stick-like white stripe at terminal 3/5 of ventral margin of cell; discocellular fascia fuscous, crescentic; a white oblique line from base to apex, section from discocellular to apex obviously wider than other section, covered with pink scales at lower angle of cell and base; submarginal area yellowish brown; a pale yellow longitudinal band along inner margin; fringes yellowish brown. Hindwing. Ground color yellow mixed with fuscous scales; both discocellular spot and postmedial line indistinct; terminal line a series of dark grayish brown spots between veins; fringes yellow. Abdomen. Yellow. Male genitalia. Uncus slender and elongate, curved ventrally; broadened basally; terminal half with dense long setae dorsally; tip sharply pointed. Tegumen trapezoidal, peniculus densely covered with long setae; vinculum almost as long as tegumen; saccus small, projecting dorsally. Juxta pyriform. Valva asymmetric; transtilla plate-like, extending towards uncus; left valva basally wide, constricting towards apex, costa well developed, strongly sclerotized, harpe finger-like at middle of costa, sacculus well developed, with finger-like process at basal third; right valva wide basally, terminal part expanded to auriform, then strongly constricted. Aedeagus sclerotized ventrally; ductus ejaculatorius arising from middle of aedeagus. Female genitalia. Unknown.

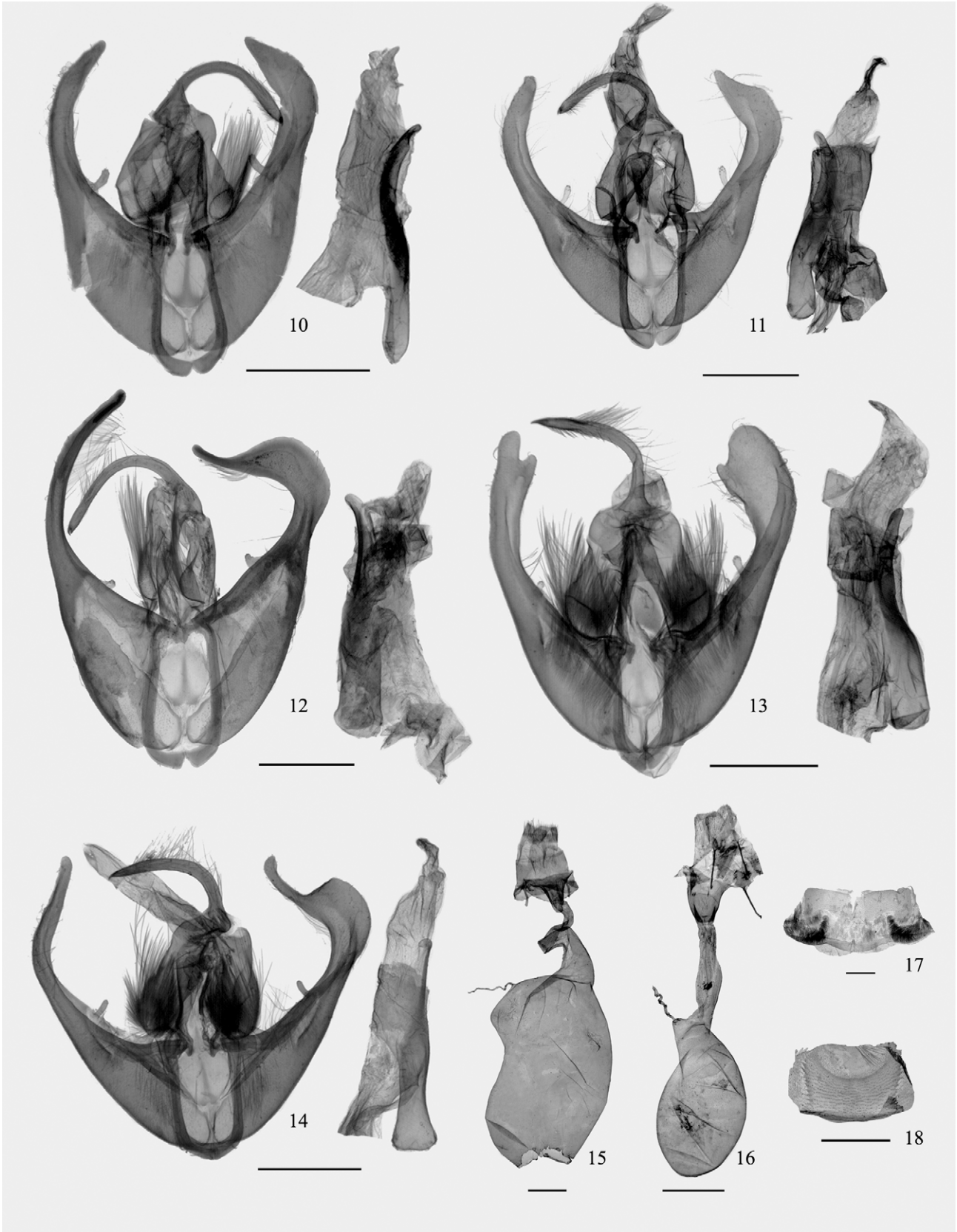
Diagnosis. The species is closely related to *M. pulcherrima* and *M. pallens* sp. nov. On the forewing of *M. pulcherrima* and *M. minuta* sp. nov, a pink longitudinal stripe is present between costa and vein Sc, while a pale orange stripe is present in *M. pallens*. The forewing of *M. minuta* has the white stripe at ventral margin of cell more pronounced than in the other species. In the male genitalia, the species is very close to *M. pallens*, but differs by tip of uncus without the additional acute hook as in *M. pallens*, and a finger-like process is present on the sacculus rather than a tuberculiform process as in *M. pallens*. Additionally, the finger-like harpe is more slender than that in *M. pallens*.

Material Examined. Holotype, ♂ (Slide No.: Noct-00274), CHINA, Yunnan: Yongsheng, Liude, 2250m, 7.VII.1984, coll. Liu Dajun (IZCAS).

Distribution. China (Yunnan).

Etymology. The specific name is derived from the Latin "*minut*", corresponding to the smaller size of the adult compared with other species of the genus.

Remarks. The holotype is partly destroyed. However, the external characters are obviously distinguishable from other species of the genus by the longer and stronger white stripe on ventral margin of cell of the forewing.



FIGURES 10–18. Genitalia and sternite. 10–14. male genitalia. 10, *Micardia pulcherrima* (Noct-00275); 11, *M. pulcherrima* (Noct-00273); 12, *M. pallens* sp. nov. (Noct-00271); 13, *M. distincta* sp. nov. (Noct-00272); 14, *M. minuta* sp. nov. (Noct-00274). 15–16. female genitalia. 15, *M. pallens* sp. nov. (Noct-00277); 16, *M. munda* (Noct-00276). 17–18. eighth abdominal sternite of female. 17, *M. pallens* sp. nov. (Noct-00277); 18, *M. munda* (Noct-00276). Scales: 1mm.

Micardia munda Leech, 1900

Figs. 8, 16, 18

Micardia munda Leech, 1900, *Trans. Ent. Soc. Lond.*, 1900: 148; Warren, 1912, *in* Seitz, *Macrolepid. World*, 3: 280; Chen, 1999, *Fauna Sinica*, 16: 912. Type locality: China, Sichuan (Pu-tsu-fong). [BNMH].
Eustrotia munda: Hampson, 1910, *Cat. Lep. Phal. Br. Mus.*, 10: 577, pl. 165, fig.28.

Diagnosis. The species is distinguishable from other species of the genus by the forewing dark red oblique triangular patch from base to apex on the forewing. In the female genitalia, the ductus bursae appears as long as the corpus bursae, while the ductus bursae is much shorter than corpus bursae in *M. pallens* sp. nov.

Material Examined. CHINA, Sichuan: Pu-tsu-Fang, 2990m, VI–VII.1890, from Leech's collection, 1♂ (Holotype) (BMNH, photograph examined). Sichuan: Luding, Xinxing, 1900m, 13.VI.1983, coll. Wang Shuyong, 1♀ (Slide No.: Noct-00276) (IZCAS). Chongqing: Wushan, Liziping, 1850m, 5.VII.1993, coll. Yao Jian, 1♀ (abdomen and left hindwing absent) (IZCAS).

Distribution. China (Sichuan, Chongqing), Myanmar.

Remarks. There are also specimens of this species from Myanmar in BMNH (M. R. Honey, pers. comm.).

Micardia argentata Butler, 1878

Fig. 9

Micardia argentata Butler, 1878, *Ann. Mag. Nat. Hist.*, (5)1: 81; Warren, 1912, *in* Seitz, *Macrolepid. World*, 3: 280, 52e; Sugi, 1982, *in* Inoue *et al.*, *Moths of Japan*: 813, pl. 197, figs. 2, 3. Type locality: Japan, Yokohama. [BMNH].
Eustrotia argentata: Hampson, 1910, *Cat. Lep. Phal. Br. Mus.*, 10: 574.

Diagnosis. The species is distinguishable from other species of *Micardia* by the white stripe covered most area of the discal cell on the forewing.

Material Examined. JAPAN: Yokohama, IX.1877, coll. Jonas, 1♂ (Holotype) (BMNH, photograph examined).

Distribution. China (Zhejiang), N. Korea, Japan.

Remarks. The holotype is examined from photos from the BMNH. A male specimen was first recorded from China by Hampson (1910). It is labelled as "C. China, Kiukiang, Snowy Valley, W.B. Pryer" and "Chekiang" (provided by Mr. M. R. Honey). There is a discrepancy for the locality between "Kiukiang" (Jiujiang, Jiangxi) and "Snowy Valley" (nr. Ningbo, Zhejiang). Because there is another label, namely "Chekiang", we report the species from Zhejiang following the advice of M. R. Honey. We also have not found the species in our collection.

Acknowledgements

We thank Martin R. Honey (Natural History Museum, London, UK) for providing photos of type materials and good advice; Yang Chao (our college) for taking some photos of genitalia. The paper was supported by the National Natural Science Foundation of China (31071952, 31101655) and a grant from the Key Laboratory of the Zoological Systematics and Evolution of the Chinese Academy of Sciences (No. O529YX5105).

References

Berio, E. (1954) Etude de quelques Noctuidae Erastriinae de Madagascar (Lepid. Noctuidae). *Mémoires de L'Institut Scientifique de Madagascar, Série E*, 5, 133–153, 1 plate, 34 txt figures.

Berio, E. (1973) Nuove specie e generi di Noctuidae Africane e Asiatische e note sinonimiche. Part II. *Annali del Museo Civico di Storia Naturale Giacomo Doria*, 79, 126–171.

Bryk, F. (1942) Zur kenntnis der Grossschmetterlinge der Kurilen. (Neue Schmetterlinge aus den Reichsmuseum in Stockholm, VI). *Deutsche Entomologische Zeitschrift, Iris*, 56, 3–113, 2 plates.

Butler, A.G. (1878) Descriptions of new species of Heterocera from Japan. Part II. Noctuites. *Annals and Magazine of Natural*

History, (5) 1, 77–85, 161–169, 192–204, 287–295.
Chen, Y.X. (1982) Noctuidae. *In*: Zhu, H.F. (Ed.), *Iconocraphia Heterocerorum Sinicorum*. Science Press, Beijing, pp. 237–390, pls. 1–118.
Chen, Y.X. (1999) *Fauna Sinica, Insecta Vol. 16, Lepidoptera, Noctuidea*. Science Press, Beijing, 1596 pp., 68 pls.
Comstock, J.H. (1918) *The Wings of Insects*. Comstock Publishing Company, Ithaca, New York, 430 pp.
Fibiger, M. & Lafontaine, J.D. (2005) A review of the higher classification of the Noctuoidea (Lepidoptera) with special reference to the Holarctic fauna. *Esperiana*, 11, 7–82.
Hampson, G.F. (1910) *Catalogue of the Lepidoptera Phalaenae in the British Museum*. Vol. 10. Taylor and Francis, London, 829 pp, xix, plates 148–173.
Holloway, J.D. (2009) The Moths of Borneo, part 13, Family Noctuidae, subfamilies Pantheinae, Bagisarinae, Acontiinae, Aediinae, Eustrotiinae, Bryophilinae, Aeroperoninae, Aventiinae, Eublemminae, miscellaneous. *Malayan Nature Journal*, 62(1–2), 1–240.
Holloway, J.D. (2011) The Moths of Borneo (part 2): families Phaudidae, Himantopteridae and Zygaenidae; revised and annotated checklist. *Malayan Nature Journal*, 63, 1–548.
Klots, A.B. (1970) Lepidoptera. *In*: Tuxen, S.L. (Ed.), *Taxonomist's Glossary of Genitalia in Insects*. Munksgaard, Copenhagen, pp. 115–130.
Kononenko, V.S. (1987) Contribution to the fauna of the noctuid moths (Lepidoptera, Noctuidae) of the Kuril Islands. *Cheshyekrylye Dal'nego Vostoka SSSR.* Vladivostok, 102–115 (in Russian).
Kononenko, V.S. (2005) *Noctuidae Sibiricae Vol 1. An annoted chek list of the Noctuidae (s.l.) (Insecta, Lepidoptera) of the Asian part of Russia and the Ural region.* Entomological Press, Soro 243pp.
Lafontaine, J.D. & Fibiger, M. (2006) Revised higher classification of the Noctuoidea. *Canadian Entomol*ogist, 138, 610–635.
Lafontaine J.D. & Schmidt, B.C. (2010) Annotated check list of the Noctuoidea (Insecta, Lepidoptera) of North America north of Mexico. *ZooKeys*, 40, 1–239.
Leech, J.H. (1900) Lepidoptera Heterocera form Northern China, Japan, and Corea. Part III. *Transactions of the Entomological Society of London*, 1900, 9–161.
Moore, F. (1867) On the Lepidopterous Insects of Bengal. *Proceedings of the Zoological Society of London*, 1867, 44–98, 612–686, 4 plates.
Nichols, S.W. (Ed.) (1989) *The Torre-Bueno Glossary of Entomology.* New York Entomological Society in cooperation with the American Museum of Natural History, New York, 840 pp.
Poole, R.W. (1989) Noctuidae. *In*: Heppner, J.B. (Ed.). *Lepidopterum Catalogus.* New Series, Fascicle 118. E.J. Brill / Flora & Fauna Publications, Leiden-New York-Copenhagen-Köln, 1314 pp.
Scoble, M.J. (1992) *The Lepidoptera, Form, Function and diversity.* Oxford University Press, Oxford, 404 pp.
Scriba, F. (1921) Drei neue Schmetterlinge aus central-Japan. *Entomologische Rundschau*, 38, 29.
Speidel, W., Fänger, H. & Naumann, C.M. (1996) The phylogeny of the Noctuidae (Lepidoptera). *Systematic Entomology*, 21, 219–251.
Sugi, S. (1982) Noctuidae. *In*: Inoue, H. *et al.* (Eds). *Moths of Japan*. Vol.1 & 2. Kodansha, Tokyo, Vol. 1, 669–913; Vol. 2, 344–405, pls. 164–223, 229, 355–382.
Ueda, K. (1984) A revision of the genus *Deltote* R. L. and its allied genera from Japan and Taiwan (Lepidoptera: Noctuidae, Acontiinae). Pt 1. A generic classification of the genus *Deltote* R. L. and its allied genera. *Bull. Kitakyushu nat. Hist. Mus.* 5, 91–133.
Ueda, K. (1987) A revision of the genus *Deltote* R. L. and its allied genera from Japan and Taiwan (Lepidoptera: Noctuidae, Acontiinae). Pt 2. Systematics of the genus *Deltote* R. L. and its allied genera. *Bull. Kitakyushu nat. Hist. Mus.* 6, 1–117.
Viette, P.E.L. (1982) Noctuelles quadrifides de Madagascar nouvelles ou peu connus, X. [Lep. Noctuidae]. *Bulletin de la Société Entomologique de France*, 87, 30–33.
Warren, W. (1912 ([1907]–1914)) Die eulenartigen Nachtfalter. *In*: Seitz, A. (Ed.), *The Macrolepidoptera of the World*. Vol. 3, Verlag A. Kernen, Stuttgart, pp. 9–511, pls 2–75.
Warren, W. (1913 (1912–1937)) Family: Noctuidae. *In*: Seitz, A. (Ed.), *The Macrolepidoptera of the World*. Vol. 11, Verlag A. Kernen, Stuttgart, pp. 31–352, pls 5–31.
Wu, C. F. (1938) superfamily Noctuoidea. *In*: Wu, C.F. *Catalogus Insectorum Sinensium*, Vol. IV. The Fan Memorial Institute of Biology, Peiping, pp. 387–694.
Zahiri R., Kitching I.J., Lafontaine J.D., Mutanen, M., Kaila, L., Holloway, J. D. & Wahlberg, N. (2011) A new molecular phylogeny offers hope for a stable family-level classification of the Noctuoidea (Insecta: Lepidoptera). *Zoologica Scripta. The Norwegian Academy of Science and Letters*, 40, 158–173.
Zahiri, R., Holloway, J., Kitching, I.J., Lafontaine, J.D., Mutanen, M. & Wahlberg, N. (2011) Molecular phylogenetics of Erebidae (Lepidoptera, Noctuoidea). *Systematic Entomology*, 37, 102–124.