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Authors: Yanqing Hu, Shuang Xue, and Baozhen Hua

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TAXONOMY AND GEOGRAPHICAL DISTRIBUTION OF MACDUNNOUGHIA (LEPIDOPTERA: NOCTUIDAE: PLUSIIINAE) OF CHINA

YANQING HU, SHUANG XUE AND BAOZHEN HUA*

Key Laboratory of Plant Protection Resources and Pest Management, Ministry of Education, Entomological Museum, Northwest A&F University, Yangling, Shaanxi 712100, China

*Corresponding author; E-mail: huabzh@nwsuaf.edu.cn

ABSTRACT

Five species of Macdunnoughia Kostrowicki, 1961 have been recorded from China. Their distribution patterns indicate that the species richness of the genus was mainly concentrated in central China, and the number of species in southeastern and northwestern China was relatively small. A key to species of the genus in China is provided. Adults and male and female genitalia are illustrated.

Key Words: Glossata, Noctuoidea, Plusiini, species richness, China

RESUMEN

Se han registrado cinco especies de Macdunnoughia Kostrowicki, 1961 en China. Planteamos el patrón principal de la distribución geográfica y una separación regional clara entre las especies estrechamente relacionadas. Encontramos que la riqueza de especies de este género se manifiesta en el centro de China, pero es relativamente fragil en el Sureste y Noroeste de China. Se provee una clave para las especies y se ilustran los adultos y su genitalia.

Palabras Clave: Plusiinae, Macdunnoughia, variación interespecífica, riqueza de especies, China continental

Macdunnoughia Kostrowicki, 1961 (Lepidoptera: Noctuidae: Plusiinae) was erected for the French species, Plusia confusa Stephens, 1850 as its type species, and can be readily recognized by the claviform stigma coalesced or divided and a dark-colored medial area on the forewing, and the remarkable sacculus processus in male genitalia.

Often species of Macdunnoughia are serious pests in forests and cultivated farmlands. The eruciform larvae bear 2 pairs of prolegs on the fifth and sixth abdominal segments apart from 3 pairs of thoracic legs (Eichlin 1975). They are polyphagous insects, frequently damaging soybean (Glycine max (L.) Merr.; Fabaceae), various Asteraceae and Brassicaceae species. Macdunnoughia confusa (Stephens, 1850) and M. crassisa (Warren, 1913) complete 2 or 3 generations per year, overwintering as larval stage in the soil (Lu et al. 1999; Ma et al. 2011).

Macdunnoughia consists of 6 described species (Ronkay et al. 2008; Kumar & Kumar 2013), and the genus is mainly distributed in China and the neighboring countries except M. confusa which is Trans-Palaearctic. Five species have been recorded from China to date (Chu & Chen 1963; Chu et al. 1964; Chen et al. 1991; Han et al. 2005).

However, species of Macdunnoughia are often confused because some cannot be distinguished by external features and their distributions overlap. The scientific names of the Chinese species are often erroneously or confusingly cited in scientific literature (Chen et al. 1991; Han et al. 2005; Ma et al. 2011). In order to avoid confusion, we herein summarize the taxonomy of this genus and present a key that effectively differentiates the species of Macdunnoughia. Also we briefly outline the distribution patterns of the component species.

MATERIALS AND METHODS

All the specimens were captured with light traps. Abdomens were macerated in 10% NaOH and temporarily mounted on glass slides in 75% glycerin. Photographs of adults were taken by a Nikon D90 digital camera. Photographs of genitalia were taken by a digital camera mounted on a Nikon SMZ1500 stereo microscope. Plates were assembled using Adobe Photoshop CS2 v9.0.

Specimens examined in this study are from the following institutions: Entomological Museum, Northwest A&F University, Shaanxi, China.
Macdunnoughia (Macdunnoughia) confusa (Stephens, 1850) 瘦银锭夜蛾
(Figs. 1, 2, 13, 13a and 19)

Plusia confusa Stephens, 1850: 291. Type-locality: Central France; Chu et al. 1964: 93.
Plusia gutta Guenée, 1852: 346. Type-locality: Austria, Hungary, France.
Macdunnoughia monosigna Chou & Lu 1979: 18. Type-locality: China, Shaanxi, Yan’an.

Diagnosis
This species can be easily distinguished from M. crassisigna and M. hybrida by the lack of a silvery streak over the claviform stigma, and by the latter’s smaller size (26-35 mm vs. 30-36 mm in M. hybrida and 31-37 mm in M. crassisigna). In male genitalia, M. confusa has a wide sacculus, short triangular clavus, short vesica with 2 large dorsal diverticula, and small cornuti (Figs. 13 and 13a). In M. crassisigna the sacculus is more narrow, clavus is rectangular, vesica is longer with a small latero-basal diverticulum, and robust cornuti (Figs. 14-15a). Saccus extends beyond the distal margin of the valva in M. confusa and does not extend beyond the distal margin of the valva as in M. hybrida (Figs. 13 and 16). In female genitalia, M. confusa has a shorter ductus bursae (Fig. 19) than M. crassisigna (Figs. 20 and 21).

Description
Males and Females. Wingspan 26-35 mm. Head grayish brown; antennae filiform; labial palpi short and upturned. Thorax densely covered with grayish brown scales. Abdomen grayish brown. On forewing, ground color grayish brown, claviform stigma white; basal and antemedial lines white; medial line faint; postmedial line brown with white at posterior part; subterminal line brown at front; terminal line brown. On hindwing, ground color grayish brown; veins highlighted (Figs. 1 and 2).

Male Genitalia. Uncus slender and long, sharp apically; tegumen relatively narrow; valva intermediate in size; cucullus arched; harpe slender and curved distally, shorter than uncus, sharp apically and bifurcate basally; sacculus intermediate in size, left processus blunt, right processus pointed; clavus triangular; saccus relatively broad (Fig. 13). Aedeagus shorter than vesica; vesica covered with 2 rows of large cornuti (Fig. 13a).

Female Genitalia. Papillae anales intermediate in size; apophyses anteriores and posteriores narrow and long; ostium sclerotized; ductus bursae sclerotized at middle; corpus bursae long with a remarkable signum (Fig. 19).

Specimens Examined

Figs. 1-12. Species of *Macdunnoughia*. (1 and 2) *Macdunnoughia* (*Macdunnoughia*) confusa; (3-6) *M. (M.) crassisinga*; (7 and 8) *M. (M.) hybrida*; (9 and 10) *Puriplusia* purissima; (11 and 12) *P. (P.) tetragona*; (1, 3, 5, 7, 9 and 11) Male; (2, 4, 6, 8, 10 and 12) Female. Scale bars = 10 mm.
Macdunnoughia (Macdunnoughia) crassisigna
(Warren, 1913) 锦锭夜蛾
(Figs. 3-6, 14-15a, 20 and 21)

Phytometra crassisigna Warren, 1913: 352.
Type-locality: Japan, Korea, India.

Phytometra rhopolosema Hampson, 1913: 513.
Type-locality: India, Nilgiris.


Distribution

This species is Trans-Palaearctic (Ronkay et al. 2008) and densely distributed in northeastern and central China and in Xinjiang. The distribution pattern may be disjunct because of natural boundaries: Tianshan and Kunlunshan (Xinjiang), Qinling Mt. and Taihangshan (central China) and Changbaishan (northeastern China) (Fig. 25).

The species occurs at altitude ranging from 34.5 m (Turpan, Xinjiang) to 2,100 m (Taibaishan, Shaanxi).

This species is barely distinguished from Macdunnoughia (Macdunnoughia) crassisigna by the forewing color pattern (Figs. 3-8). In male genitalia, Macdunnoughia (Macdunnoughia) crassisigna has a long, narrow sacculus (Figs. 14 and 15), long vesica, and robust cornuti (Figs. 14a and 15a) compared with a short, wide sacculus (Fig. 16), short vesica, and small cornuti (Fig. 16a) in Macdunnoughia (Macdunnoughia) crassisigna. In female genitalia, Macdunnoughia (Macdunnoughia) crassisigna has a long ductus bursae and an accessory bursae that is longer than the corpus bursae (Figs. 20 and 21); in Macdunnoughia (Macdunnoughia) crassisigna the ductus bursae is short and the accessory bursae is shorter than the corpus bursae (Fig. 22).

Description

Males and Females. Wingspan 31-37 mm. Head brown or dark brown; antennae filiform; labial palpi short and upturned. Thorax densely covered with brown scales. Abdomen brown. On forewing, a silvery streak (or bifurcate silvery streak) over white claviform stigma; basal and antemedial lines white; medial line faint; postmedial line brown or dark brown with white at posterior part; subterminal line brown, dark color at front; terminal line brown. On hindwing, ground color grayish brown; veins highlighted (Figs. 3-6).

Female Genitalia. Papillae anales intermediatesize; apophyses anteriores and posteriores narrow and long; ostium slightly sclerotized; ductus bursae slightly sclerotized and wrinkled; corpus bursae shorter than accessory bursae, with a large signum; accessory bursae wrinkled (Figs. 20 and 21).

Specimens Examined


Distribution

This species is distributed in the Himalayan-Pacific Region. It is widely distributed from northeastern China through central China to the Tibetan plateau (Ronkay et al. 2008). The distribution of Macdunnoughia (Macdunnoughia) crassisigna extends from north-
eastern China to southwestern and southeastern China (Fig. 25).

The highest altitude record where *M. crassisigna* has been collected is 3,950 m (Shigatse, Tibet).

*Macdunnoughia (Macdunnoughia) hybrida* Ronkay, 1986 拟瘦银锭夜蛾
(Figs. 7, 8, 16, 16a and 22)


Type-locality: North Korea, Province North Pyongan, Myohyang Mt.; Han et al. 2005: 19; Ronkay et al. 2008: 23.

Diagnosis

*Macdunnoughia hybrida* and *M. crassisigna* are confused in China because of the nearly identical forewing pattern (Figs. 3-8). Accurate identification can be made by examining genitalia.
Description

Male and female. Wingspan 30-36 mm. Head brown; antennae filiform; labial palpi short and upturned. Thorax densely covered with brown scales. Abdomen brown. On forewing, a silvery streak over white claviform stigma; basal and antemedial lines white; medial line faint; postmedial line brown with white at posterior part; subterminal line brown, dark color at front; terminal line brown. On hindwing, ground color grayish brown and dark color near outer margin; veins highlighted (Figs. 7 and 8).

Male Genitalia. Uncus slender and long, sharp apically; tegumen intermediate in size; valva relatively broad; cucullus arched; harpe slender, sharp apically and bifurcate basally, shorter than uncus; sacculus processus short and pointed apically; clavus triangular; saccus intermediate in size (Fig. 16). Aedeagus shorter than vesica; vesica with 2 rows of large cornuti (Fig. 16a).

Female Genitalia. Papillae anales intermediate in size; apophyses anteriores and posteriores narrow and long; ostium sclerotized; ductus bursae short, broad at middle, sclerotized; corpus bursae slender and long, with a large signum (Fig. 22).

Specimens Examined


Distribution

_Macdunnoughia hybrida_ is distributed in northeastern China (Ronkay et al. 2008). This study showed the distribution to extend southwards along the coast in eastern China (Fig. 25).

_Macdunnoughia (Puriplusia) purissima_ (Butler, 1878)

淡银纹夜蛾

(Figs. 9, 10, 17, 17a and 23)

_Plusia purissima_ Butler, 1878: 202. Type-locality: Japan, Yokohama; Chu et al. 1964: 96.


_Macdunnoughia purissima:_ Han et al. 2005: 19; Ronkay et al. 2008: 25.

Diagnosis

It is related to _M. tetragona_ and can be distinguished from the latter by the light-colored medial area and the visible postmedial line on forewing (Figs. 9 and 10). Cornuti are absent in male genitalia (Fig. 17a) and the ductus bursae is 1.5 times as long as that of _M. tetragona_ (Figs. 23 and 24).

Description

Male and Female. Wingspan 28-31 mm. Head gray; antennae filiform; labial palpi short and upturned. Thorax densely covered with gray scales. Abdomen gray. On forewing, ground color gray, medial area brown, a black streak over white claviform stigma; basal, antemedial, postmedial and terminal lines brown or reddish brown; medial line faint; subterminal line grayish brown. On hindwing, ground color grayish brown and dark color near outer margin; veins highlighted (Figs. 9 and 10).

Male Genitalia. Uncus narrow, sharp apically, 1.5 times as long as harpe; tegumen intermediate in size; valva slender; cucullus arched; harpe short, sharp apically, almost as long as saccus processus; saccus processus sharp apically; clavus finger-shaped; saccus short (Fig. 17). Aedeagus shorter than vesica; vesica with many small dots (Fig. 17a).

Female Genitalia. Papillae anales intermediate in size; apophyses anteriores and posteriores narrow and long; ostium broad and slightly sclerotized; ductus bursae long and wrinkled; corpus bursae similarly rounded; accessory bursae long and wrinkled (Fig. 23).

Specimens Examined

Distribution

This species is distributed from the northeastern part of China southwards to the central Chinese mountains (Ronkay et al. 2008). This study showed the distribution to extend southwards to Yunnan (Fig. 25).

Altitudinal range is from 400 m (Xixiang, Shaanxi) to 2,990 m (Dianchangshan, Yunnan).

Figs. 19-24. Female genitalia of Macdunnoughia. (19) Macdunnoughia (Macdunnoughia) confusa; (20 and 21) M. (M.) crassisigna; (22) M. (M.) hybrida; (23) M. (Puriplusia) purissima; (24) M. (P.) tetragona. Scale bars = 1 mm.
Macdunnoughia (Puriplusia) tetragona (Walker, [1858]): 932. Type-locality: India, Hindustan.

Plusia tetragona Walker, [1858]: 63. Type-locality: India, Darjeeling.

Puriplusia zayuensis Chou & Lu 1982: 98. Type-locality: China, Xizang, Zayu.

Puriplusia tetragona: Chen et al. 1991: 313.


Diagnosis

Macdunnoughia tetragona can be distinguished from M. purissima by the dark medial area on forewing (Figs. 9-12); the male genitalia have a row of large cornuti (Fig. 18a); ductus bursae and accessory bursae is short (Fig. 24).

Description

Male and Female. Wingspan 27-34 mm. Head blackish gray; antennae filiform; labial palpi short and upturned. Thorax densely covered with gray scales. Abdomen grayish. On forewing, ground color blackish gray, medial area black, a black streak over white claviform stigma; basal line grayish black; antemedial line black; medial line faint; postmedial line black with a little red color; subterminal line grayish black; terminal line black at front. On hindwing, ground color grayish brown; veins highlighted (Figs. 11 and 12).

Male Genitalia. Uncus narrow, sharp apically, 1.5 times as long as harpe; tegumen intermediate in size; valva slender; cucullus arched; harpe short and curved, sharp apically, almost as long as sacculus processus; sacculus processus sharp apically, broader than harpe; clavus finger-shaped; saccus relatively short (Fig. 18). Aedeagus shorter than vesica; vesica with a row of cornuti (Fig. 18a).
Female Genitalia. Papillae anales intermediate in size; apophyses anteriores and posteriores narrow and long; ostium broad and slightly sclerotized; ductus bursae short and wrinkled; corpus bursae similarly rounded; accessory bursae relatively short and wrinkled (Fig. 24).

Specimens Examined


Distribution

This species is distributed in the Himalayan-Pacific Region, including the eastern edge of the Tibetan plateau, the eastern Chinese mountains and Taiwan (Ronkay et al. 2008). In this survey, we found that it also occurs in central China. Its distribution overlaps with that of *M. purissima* at the Qinling Mt. (Shaanxi) and Shennongjia (Hubei) (Fig. 25).

Altitudinal range is from 760 m (Mengyang, Yunnan) to 3,250 m (Qamdo, Tibet).

REFERENCES CITED


