

ORIGINAL ARTICLE

# Taxonomic review of the genus *Ochyrotica* Walsingham from China (Lepidoptera: Pterophoridae: Ochyroticinae)

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**Abstract** The genus *Ochyrotica* from China is reviewed, with four species treated. The male of *O. connexiva* (Walsingham) is described for the first time, *O. zolotuhini* Ustjuzhanin & Kovtunovich is firstly recorded in China, and the distribution information of *O. concursa* (Walsingham) in China is clarified. The structural variations of the genus and all species from China are discussed. Images of the adults and illustrations of genital structures are provided, along with a key to the known Chinese species.

**Key words** Lepidoptera, Pterophoridae, *Ochyrotica*, new record, China.

*Ochyrotica* is the only genus of the uncleft wings subfamily Ochyroticinae. It can be recognized by the head with erect tip-furcated scales around occiput and cervix, the forewing without naked field,  $R_3$  and  $R_4$  stalked, and the termen incurved.

Walsingham (1891) erected *Ochyrotica* for *O. fasciata* Walsingham, 1891. Meyrick (1913) listed three species in Lepidopterorum Catalogus: *O. fasciata* Walsingham, 1891, *O. concursa* (Walsingham, 1891) (*Steganodactyla*) and *O. connexiva* (Walsingham, 1891) (*Steganodactyla*). Geade (1916) described *O. buergersi* from Indonesia and Irian. Durrant (1916) published one more species from this region, *Steganodactyla cretosa*. Meyrick (1921) described *O. placozone* in the course of studying Pterophoridae of Peru. More recently, Arenberger and Gielis studied the *Ochyrotica connexiva*-group, the *Ochyrotica concursa*-group, and the *Ochyrotica cretosa*-group (Arenberger, 1987, 1988a, b, 1990, 1992, 1995, 1997; Gielis, 1988, 1989, 1990, 1991, 2003a, b, c, 2006, 2008).

*Ochyrotica* comprises 26 known species worldwide (Gielis, 1993, 2003, 2008; Ustjuzhanin & Kovtunovich, 2010). Among them, 17 species are distributed in the Indo-Australian Region (Arenberger & Gielis, 1988), 4 species in the Neotropical Region (Arenberger & Gielis, 1988; Gielis, 2006), 4 species in the Afrotropical Region (Arenberger, 1990; Bigot, 1969; Gibeaux, 1994; Gielis, 2008), and 2 species, *O. connexiva* (Walsingham) and *O. yanoi* Arenberger in both Palaearctic and Indo-Australian Regions (Yano, 1963a; Arenberger, 1988, 1995).

The biology of *Ochyrotica* is poorly known. Yano (1963) described the mature larva and pupa of *O. yanoi* (as *O. concursa*). Their host plants include members of Verbenaceae and Convolvulaceae (Yano, 1963; Arenberger, 1995; Gielis, 2003, 2006).

The population of plume moths in nature is lower. So the number of specimens available for study is limited. In the 26 *Ochyrotica* species, 8 were monotype, including 3 based on male species and 5 on female species.

Four species were recorded in China previously. *O. connexiva* (Walsingham) and *O. taiwanica* Gielis were reported to occur in Taiwan, *O. concursa* (Walsingham) and *O. yanoi* Arenberger were distributed in Taiwan and Mainland China (Arenberger, 1995; Gielis, 2003; Li, Hao & Wang, 2003). In this study, we describe the male of *O. connexiva* (Walsingham) for the first time, firstly record *O. zolotuhini* Ustjuzhanin & Kovtunovich in China, and clarify the distribution information

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of *O. concursa* (Walsingham) in China. We have also discussed the structural variations of the genus and all the species from China.

## Material and methods

Specimens used in this study are from the Insect Collection, College of Life Sciences, Nankai University, Tianjin (NKUM) and the Institute of Zoology, Chinese Academy of Science, Beijing (IZCAS). Methods of genitalia dissection follow Li (2002). Morphological terminology follows Arenberger & Gielis (1988a) and Gielis (1989).

Abbreviations. Ar. C: the collection of E. Arenberger's. BMNH: Natural History Museum, London, Great Britain. IZCAS: Institute of Zoology, Chinese Academy of Science, Beijing, China. NKUM: Insect Collection, College of Life Sciences, Nankai University, Tianjin, China. USNM: United States National Museum of Natural History, Smithsonian Institution, Washington, DC, USA. CVKPU: the collection of V. Kovtunovich and P. Ustjuzhanin.

### Ochyroticinae Wasserthal, 1970

Ochyroticinae Wasserthal, 1970. *Zeitschr. Morph. Tiere*, 68: 205.

Type genus: *Ochyrotica* Walsingham, 1891. *Entomologist's Mon. Mag.*, 27: 217.

Wasserthal (1970) erected the subfamily Ochyroticinae based on the presence of DbI in *Ochyrotica* and its absence in *Agdistis* after analysing the primary setal pattern of the Pterophorid first instar larvae. He regarded Ochyroticinae as a sister group of Pterophorinae considering the presence of DbI in Pterophorinae and its absence in Platyptiliinae. This subfamily Ochyroticinae was not accepted until Gielis (1993), who analysed the phylogeneric relationships between the genera of Pterophoridae.

### *Ochyrotica* Walsingham, 1891

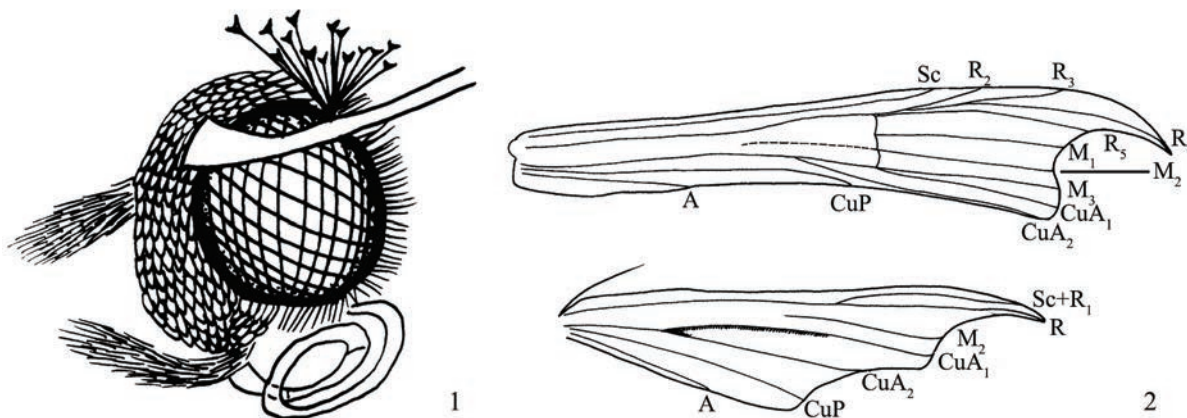
*Ochyrotica* Walsingham, 1891. *Entomologist's Mon. Mag.*, 27: 217.

Type species: *Ochyrotica fasciata* Walsingham, 189, by monotypy and original designation.

*Steganodactyla* Walsingham, 1891. *Entomologist's Mon. Mag.*, 27: 241.

Type species: *Steganodactyla concursa* Walsingham, 1891, by original designation.

Head (Fig. 1) smooth, appressedly scaled, without frontal tuft, with prominent erect tip-bifid scales around occiput and cervix. Antennae about 1/2 length of forewing. Labial palpus short, without hair brush along third segment. Forewing not cleft, without naked field; more colourful than *Agdistis*, often yellowish brown to brown, with ivory-white on whole forewing, or grey to greyish-yellow, with brown termen; apex very prominent due to incurved termen. Hindwing not cleft, grey, termen sinuate. Fore wing veins (Fig. 2):  $R_1$  absent,  $R_2$ – $R_5$  present;  $R_3$  Stalked with  $R_4$ ;  $M_1$ ,  $M_2$  and  $M_3$  nearly parallel;  $CuA_1$  and  $CuA_2$  present and separate,  $CuA_1$  come from angle of cell,  $CuA_2$  come from cell. Hind wing veins (Fig. 2):  $M_2$  and  $CuA_1$  nearly parallel.



Figs 1–2. *Ochyrotica yanoi* Arenberger. 1. Head. 2. Veins.

Male genitalia. Uncus simple, tapering, but bifid in *O. koteka* and *O. bjoerntadti*. Tegumen arched. Valvae symmetrical, elongate except *O. salomonica* shrunk at middle; sacculus often with processes or spines. Saccus simple. Anellus bilobed or ring-shaped. Aedeagus straight or curved, with or without cornutus. Sternite VIII well developed, forming various processes.

Female genitalia. Ostium and antrum symmetrical, centrally located. Ductus bursae simple, without sclerite. Corpus bursae spherical to elongately spherical, with or without signum.

Host plants. Convolvulaceae: *Ipomoea* sp., *Argyreia* sp. (Arenberger, 1995; Gielis, 2006).

Distribution. Indo-Australian Region, Neotropical Region, Afrotropical Region and Palaearctical Region (Arenberger, 1990; Bigot, 1969; Arenberger & Gielis, 1988; Gibeaux, 1994; Gielis, 2003, 2006).

Diagnosis. *Ochyrotica* is the only genus of the subfamily Ochyroticinae. It can be distinguished from other genera of the family Ptreophoridae by the head with erect tip-furcated scales around occiput and cervix, both wings unclenched, the forewing without naked field, and with the termen incurved.

Remarks. Gielis (1993, 2006) described that  $R_1$  was present in *Ochyrotica*, while Yano (1963a) and Arenberger (1995) indicated that  $R_1$  was absent. In this study, we found that  $R_1$  was absent in *Ochyrotica*.

Gielis (1988a, b) stated the presence of the signum in *Ochyrotica*; Yano (1963a) and Gielis (1993, 2006) stated that the signum was absent in the female genitalia of *Ochyrotica*; and Arenberger (1995) described that signum was absent or present in *Ochyrotica*. We confirm the presence or absence of signum in this study.

#### Key to the *Ochyrotica* species from China

1. Forewing yellowish brown to brown, tinged with ivory-white on whole forewing ..... 2  
     Forewing grey to greyish yellow, with brown at termen ..... *O. yanoi* (Figs 11–15)
2. Markings of costal and dorsal margins touched twice ..... *O. connexiva* (Figs 3–10)  
     Markings of costal margin and dorsal margin touched once ..... 3
3. Valva with a spined patch in middle; aedeagus straight, stout, without process at base ..... *O. taiwanica*  
     Valva without spined patch; aedeagus curved, with a hooked process at base ..... *O. zolotuhini* (Figs 19–24)

#### *Ochyrotica concursa* (Walsingham, 1891)

*Steganodactyla concursa* Walsingham, 1891. *Entomologist's Mon. Mag.*, 27: 241. Type locality: Sri Lanka. Coll. BMNH.

*Ochyrotica concursa* (Walsingham), Meyrick, 1910. *Gen. Ins.*, 100: 20.

Host plants. *Argyreia* sp., *Lantana* sp. (Gielis, 2003).

Distribution. Oriental: Sri Lanka.

Remarks. According to records, *O. concursa* (Walsingham) is distributed in Sri Lanka. Yano (1963) described the mature larva and pupa of *O. concursa* (Walsingham) based the specimens from Japan, and recorded its distribution in Taiwan and Mainland China. Arenberger (1988) found the type-specimen of *O. concursa* different from all the specimens described by Yano (1963) from Japan. So he published a new species, *O. yanoi* Arenberger after checking the specimens described by Yano (1963).

Wu & Shen (2002) recorded the occurrence of *O. concursa* in several counties and cities of Fujian (Fuzhou, Minhou, Xinyou, Putian *et al.*). However they didn't provide information and figures of the examined material. Li, Hao & Wang (2003) reported the occurrence of this species in China according to the above information. In this study, we found it is *O. yanoi*, not *O. concursa* by checking specimens from Pinghe, Putian and Changle, Fujian deposited in IZCAS. Thus *O. concursa* is not distributed in China so far.

So *O. concursa* only distributed in Sri Lanka for the mistaken records in China and Japan.

#### *Ochyrocita connexiva* (Walsingham, 1891) (Figs 3–10)

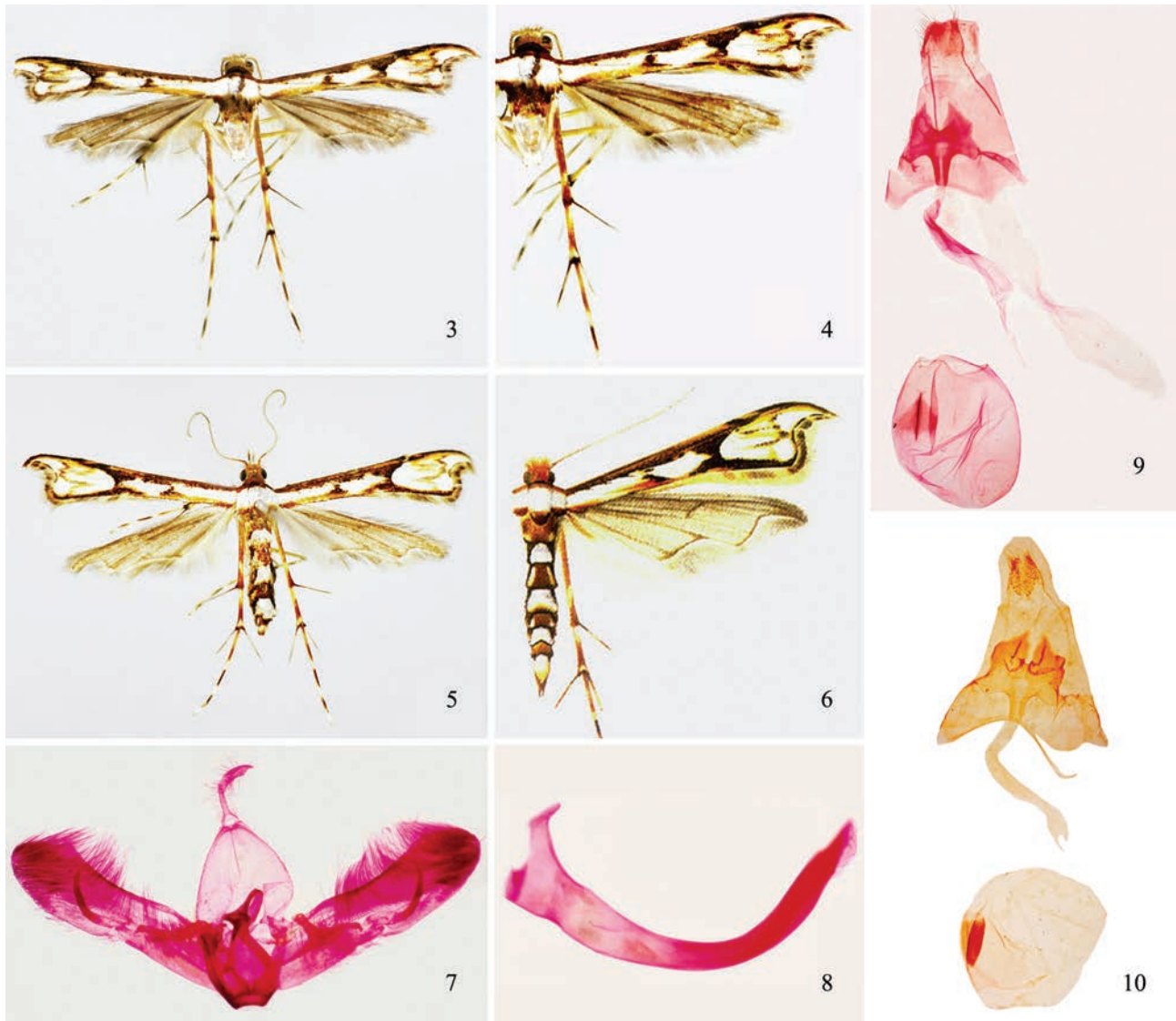
*Steganodactyla connexiva* Walsingham, 1891. *Entomologist's Mon. Mag.*, 27: 242, taf. 12, fig. 4. Type locality: Burma. Holotype ♀:

“Thandsung, Karen Hills, 4 000ft., Pegu, Doherty, 1890, no. 41747”. GU 17992 ♀. Coll. BMNH.

*Ochyrocita connexiva* (Walsingham), Meyrick, 1913. *Lep. Cat.*, 17: 31.

Adult (Figs 3–6). Wing span 16–17 mm.

Male genitalia (Figs 7–8). Uncus simple, hooked, acute at apex. Tegumen arched. Cucullus wide and round, equal to base of valva in width. Saccular process with basal portion strongly curved, directed towards base of valva, distal portion



Figs 3–10. *Ochyrotica connexiva* (Walsingham). 3–6. Adult. 7–8. Male genitalia. 9–10. Female genitalia. 3–4. Genitalia slide No. HSL09115 (♂). 5. Genitalia slide No. HSL09351 (♀). 6. Provided by Arenberger (1995). 7–8. Genitalia slide No. HSL09115. 9. Genitalia slide No. HSL09351. 10. Genitalia slide No. HSL09168.

equal to uncus in length, reaching about 3/4 of costa. Saccus with anterior margin slightly concave. Anellus with basal portion biforked, distal portion ring-shaped. Aedeagus about equal to valva in length, arcuate, with a wide hooked process at base.

Female genitalia (Figs 9–10). As illustrated.

Material examined. China, 1 ♀, Mt. Jianfeng, Hainan Province, 8 April 1980, genitalia slide No. HSL02547; 1 ♂, Mt. Diaoluo, Hainan, 2 June 2007, collected by Zhi-Wei Zhang and Wei-Chun Li, genitalia slide No. HSL09115; 1 ♀, Mt. Wuzhi, Hainan Province, elev. 700m, 18 May 2007, collected by Zhi-Wei Zhang and Wei-Chun Li, slide No. HSL09351; 1 ♀, Shuiman, Mt. Wuzhi, Hainan Province, elev. 640m, 20 May 2007, collected by Zhi-Wei Zhang and Wei-Chun Li, genitalia slide No. HSL09116; 1 ♀, Donger gongzuozhan, Mt. Bawang, Hainan Province, elev. 1000m, 23 April 2009, collected by Bing-Bing Hu and Qing Jin, genitalia slide No. HSL09168. The aboved specimens are deposited in NKUM. 1 ♀, Tianchi, Hainan Province, 10 April 1980, genitalia slide No. P137, deposited in IZCAS.

Distribution. China (Hainan, Taiwan); Myanmar, Thailand, India, Bhutan.

Diagnosis. This species can be distinguished by its forewing markings with costal margin and dorsal margin touched

twice, which touched only once in other 10 species of *O. connexiva*-group. It is similar to *Ochyrotica zolotuhini* Ustjuzhanin & Kovtunovich (Figs 19–24) in the male genitalia, but can be distinguished by the wide and round cucullus nearly equal to base of valva in width; the saccular process reaching about 3/4 of costa; the aedeagus with a wider hooked process at base; and the sternite VII in female genitalia irregular V-shaped posteriorly.

Remarks. This species was originally described by Walsingham (1891) based on a female specimen from Mt Karen Hills, Pegu, Burma. Arenberger (1988) redescribed this species and provided the adult photograph and drawings of the holotype. Arenberger (1995) presented a colour male adult photograph, but did not describe the genitalia. Yano (1966) firstly recorded its distribution in Taiwan. We examined a male and five female specimens from Hainan Province in this study. Based on which we describe the male for the first time and found some variations in the shape and width of the posteriorly V-shaped sternite VII (Figs 9–10) in the female genitalia.

### ***Ochyrotica taiwanica* Gielis, 1990**

*Ochyrotica taiwanica* Gielis, 1990. *Bishop Museum Occasional Papers*, 30: 294. Type locality: Taiwan. Holotype ♂, “Taiwan: Taibei, 17 November 1932, S. Issiki, genitalia CG 1948, coll. USNM.

*Ochyrotica connexiva*.- auct. (nec Walsingham, 1891).

Distribution. China (Taiwan).

Diagnosis. This species is similar to all species of *connexiva*-group in the forewing markings. It can be distinguished by the costa with a smastoid process at 1/3 of valva, the valva with a spined patch in middle and a stout thorn-like process beyond it, and the small, nearly triangular saccular process.

Remarks. Gielis (1990) reported this species based on a single male specimen collected by Issiki from Taibei.

### ***Ochyrotica yanoi* Arenberger, 1988** (Figs 11–18)

*Ochyrotica yanoi* Arenberger, 1988. *Ent. Z. Frankfurt A. M.*, 98(19): 276–279, figs 3a–c. Type locality: Japan. Holotype, ♀: “Ryukyus, Okinawa, 17 November 1960, K. Yasumatsu”. GU 2698 ♀, coll. Ar. C.

*Ochyrotica concursa*.- auct. (nec Walsingham, 1891)

Adult (Figs 11–12). Wingspan 15–16 mm.

Male genitalia (Figs 16–18). As illustrated.

Female (Figs 13–15). As illustrated.

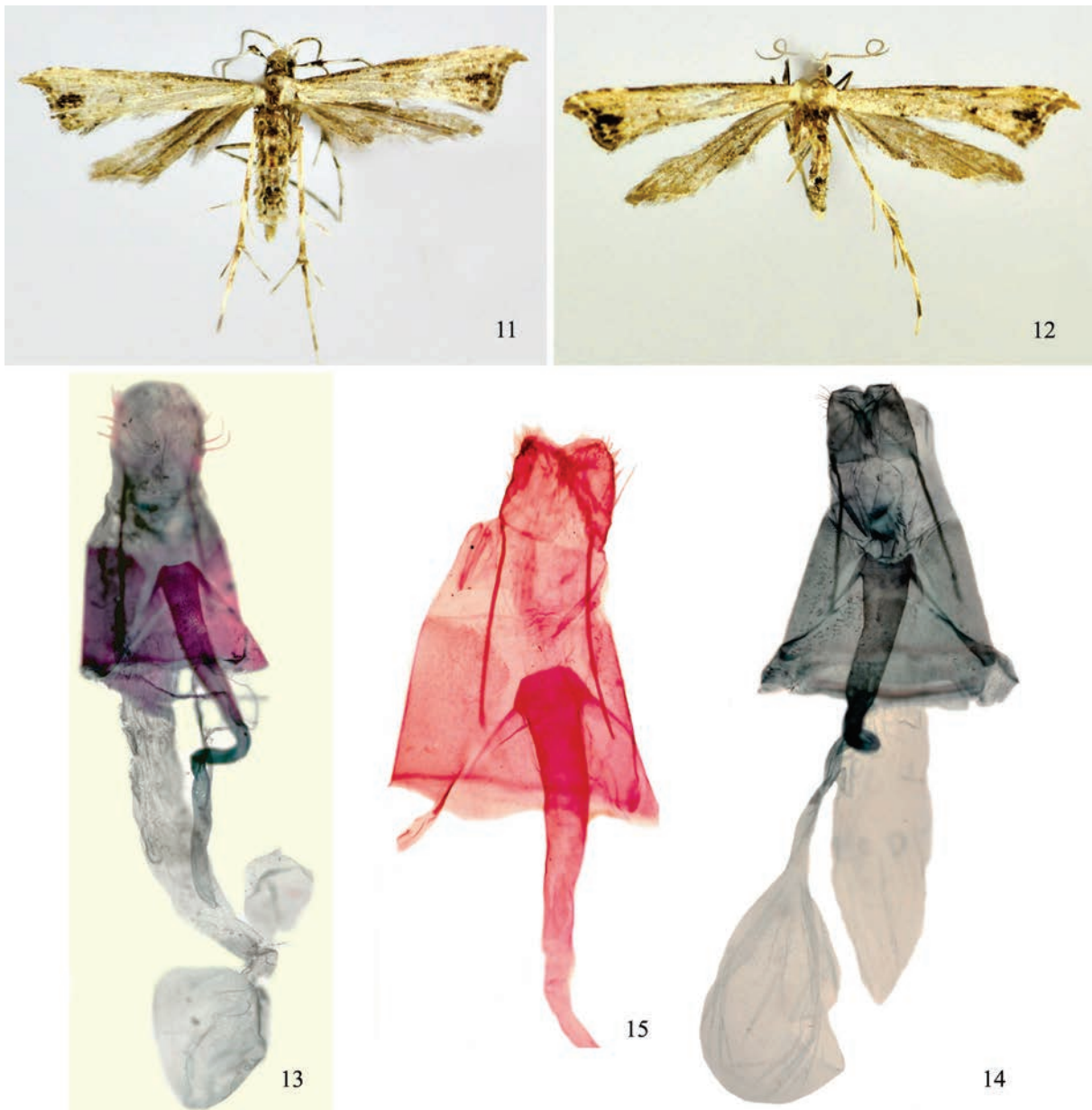
Material examined. China, 1♂, Putian Institute of Agricultural Science, Fujian Province, November 1978, genitalia slide No. HSL02363; 1♀, Jiayi Natural Reserve, Hainan Province, elev. 220 m, 14 July 2009, collected by Zhao-Hui Du and Lin-Lin Yang, genitalia slide No. HSL09120; 1♂, Jiayi Natural Reserve, Hainan Province, elev. 220 m, 16 August 2009, collected by Zhao-Hui Du and Lin-Lin Yang, genitalia slide No. HSL09118; 1♀, Forestry Bureau, Mt. Bawang, Hainan Province, elev. 137 m, 24 April 2009, collected by Qing Jin and Bing-Bing Hu, genitalia slide No. HSL09166; 1♀, Mt. Duowen, Hainan Province, elev. 120 m, 1 May 2009, collected by Bing-Bing Hu and Qing Jin, genitalia slide No. HSL09352; 1 abdomen absent, Mt. Duowen, Hainan Province, elev. 120 m, 1 May 2009, collected by Bing-Bing Hu and Qing Jin; 1♂, Mt. Yingge, Hainan Province, 8 July 2009, collected by Bing-Bing Hu, genitalia slide No. HSL09353, deposited in NKUM; 1♂, Ganru, Jinxi, Pinghe, Fujian Province, 29 November 1973, collected by Shi-Cheng Qiao, genitalia slide No. HSL02362; 1♂, Putian Institute of Agricultural Science, Fujian Province, November 1978, genitalia slide No. HSL02830; 1♀, Changle, Fujian Province, 7 November 1987, genitalia slide No. 88104; 1♀, Putian, Fujian Province, genitalia slide No. 88105, deposited in IZCAS.

Host plants. Convolvulaceae: *Ipomoea batatas* Lam. var. *edulis* Makino (Yano, 1963).

Distribution. China (Fujian, Hainan, Taiwan); Japan, Vietnam, Philippines, India, Indonesia.

Diagnosis. This species is similar to *O. concursa* (Walsingham, 1891) externally, but can be distinguished from the latter by the forewing with elongate brown marking placed centrally at termen (Figs 11–12). It also resembles *O. brevipex* Gielis, 1989 in the male genitalia, but can be distinguished by the forewing with indistinct costal margin marking and the above brown elongate marking, and the female genitalia with antrum nearly equal to length of the apophyses posteriores (Figs 13–15).

Remarks. This species was wrongly identified as *O. concursa* by Yano (1963). Arenberger (1988) named this species as *O. yanoi* after checking all the recorded specimens of *O. concursa* from Yano (1963). Gielis (1990) reported the distribution of this species in Hainan for the first time, and Yano & Heppner (1992) firstly recorded its distribution in



Figs 11–15. *Ochyrotica yanoi* Arenberger, 1988. 11–12. Adult. 13–15. Female genitalia. 11. Genitalia slide No. HSL09352 (♀). 12. Genitalia slide No. HSL09353 (♂). 13. Genitalia slide No. HSL09120. 14. Genitalia slide No. HSL09166. 15. Genitalia slide No. HSL09352.

Taiwan, China. In this study, we add specimens from Fujian and Hainan Provinces.

There are variations in the female genitalia (Figs 13–15), mainly in the posterior margin of the antrum which varies from nearly straight to crescently curved, the shape of antrum, and the width of the antrum at base.

***Ochyrotica zolotuhini* Ustjuzhanin & Kovtunovich, 2010** (Figs 19–24)

*Ochyrotica zolotuhini* Ustjuzhanin & Kovtunovich, 2010. *Amurian Zoological Journal*, II(3): 245. Type locality: Vietnam. Holotype ♂: “C. Vietnam, Thua Thien Hue Province, Bach Ma N. P. (16°12’N, 107°51’E, elev. 1250 m), 20–22 April 2009, leg. V. Zolotuchin”. Gen. pr. No. -22892 ♂. Coll. BMNH. Paratypes: 1 ♀, BMNH, gen. pr. No. - 22893. C. Vietnam, Nghe An Prov Pu Mat NP Tam Dinh Village (19°10’N, 104°37’E, elev. 170 m), 4–5 October 2008, V. Zolotukhin leg.; 2 ♂, 3 ♀, Vietnam, in CVKPU.



Figs 16–18. *Ochyrotica yanoi* Arenberger, 1988, male genitalia. 16–17. Genitalia slide No. HSL09353. 18. Genitalia slide No. HSL09118.

Adult (Figs 19, 21, 23). Wingspan about 16 mm.

Male genitalia (Figs 20, 22, 24). As illustrated.

Female. Not available.

Material examined. China, 1♂, Mt. Yingge, Hainan Province, 22 December 2009, collected by Bing-Bing Hu, genitalia slide No. HSL09117; 1♂, Mt. Wuzhi Nature Reserves, Hainan Province, elev. 220 m, sweeping, 13 April 2009, by Bing-Bing Hu and Qing Jin, genitalia slide No. HSL09167, deposited in ICNKU.

Distribution. China (Hainan); Vietnam.

Diagnosis. This species resembles *O. connexiva* (Walsingham), but can be distinguished from the latter by the forewing markings with costal margin and dorsal margin touched once; the narrow cucullus about 1/2 width of the valva at base; the saccular process reaching near apical of the valva; the aedeagus with a narrow hooked process at base; and the sternite VII in female genitalia regularly V-shaped posteriorly.

Remarks. Two specimens were collected, one from Mt. Yingge, Hainan Province (HSL09117), and another from Mt. Wuzhi, Hainan Province (HSL09167). By comparing with original work, both specimens belong to *O. zolotuhini* Ustjuzhanin & Kovtunovich. But there are some variations: 1) the costal margin marking of the specimen from Mt. Yingge (HSL09117) is slightly wider than that of Ustjuzhanin & Kovtunovich (2010) (Fig. 21); the specimen from Mt. Wuzhi (HSL09167) was collected by sweeping methods during daytime, so the wings were heavily worn, but we can make out the marking; 2) the aedeagus of the two specimens is slightly longer and curved than that of Ustjuzhanin & Kovtunovich (2010); the hook process of the aedeagus from Mt. Wuzhi (HSL09167) is slightly curved basally than that from Mt. Yingge (HSL09117) and that of Ustjuzhanin & Kovtunovich (2010); the distal shape of the aedeagus from Mt. Wuzhi (HSL09167) and that of Ustjuzhanin & Kovtunovich (2010) is slightly rounder than that from Mt. Yingge (HSL09117).

This species is newly recorded in China



Figs 19–24. *Ochyrotica zolotuhini* Ustjuzhanin & Kovtunovich. 19, 21, 23. Adult. 20, 22, 24. Male genitalia. 19–20. HSL09117. 21–22. Provided by Ustjuzhanin & Kovtunovich (2010). 23–24. Genitalia slide No. HSL09167.

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