Seven new species in the genus *Scythropiodes* Matsumura (Lepidoptera: Lecithoceridae) from China

Qingyun WANG, Houhun LI[1①]

College of Life Sciences, Nankai University, Tianjin 300071, China

Abstract: Seven new species in the genus *Scythropiodes* Matsumura are described from China: *S. multicornutus* sp. nov., *S. bispinus* sp. nov. and *S. siculiformis* sp. nov. from Yunnan, *S. longicornis* sp. nov. and *S. foliiformis* sp. nov. from Tibet, *S. dentirotatus* sp. nov. from Sichuan, and *S. grandimacularis* sp. nov. from Hainan. The female of *S. dorsoprocessus* Wang & Li, 2016 is described for the first time. Images of adults and genitalia of these new species are provided.

Key words: Microlepidoptera; Gelechioidea; Oditinae; taxonomy

绢祝蛾属 *Scythropiodes* Matsumura 七新种记述（鳞翅目：祝蛾科）

王青云，李后魂 [1①]

南开大学生命科学学院，天津 300071

摘要：记述我国绢祝蛾属 *Scythropiodes* Matsumura 7 新种：多刺绢祝蛾 *S. multicornutus* sp. nov.，双刺绢祝蛾 *S. bispinus* sp. nov. 和剑绢祝蛾 *S. siculiformis* sp. nov. 采自云南，长角绢祝蛾 *S. longicornis* sp. nov. 和叶绢祝蛾 *S. foliiformis* sp. nov. 采自西藏，齿突绢祝蛾 *S. dentirotatus* sp. nov. 采自四川，大斑绢祝蛾 *S. grandimacularis* sp. nov. 采自海南。首次报道了背突绢祝蛾 *S. dorsoprocessus* Wang & Li, 2016 的雌性个体。提供了新种的成虫和外生殖器特征图。

关键词：小蛾类；麦蛾总科；木祝蛾亚科；分类

Introduction

The genus *Scythropiodes* belongs to the subfamily Oditinae Lvovsky, 1996 and is mainly distributed in Asian part of the Oriental Region, especially in Southeast Asia but with some distributed in the African Region. The classification status of this subfamily has been controversial (Kaila *et al.* 2011; Heikkilä *et al.* 2014; Sohn *et al.* 2016; Wang & Li 2016). Heikkilä *et al.* (2014) suggested Oditinae be subordinated to their redefined family Depressariidae and Sohn *et al.* (2016) supported Heikkilä's opinion. But the redefined Depressariidae was paraphyletic, and Oditinae was not closely related to Depressariinae. Wang & Li (2016) disagreed with placing Oditinae into Depressariidae based on their comparative morphological study of the two subfamilies, and they proposed to provisionally place the Oditinae in Lecithoceridae. In the present paper, we still treat Oditinae as a member of Lecithoceridae pending further studies being conducted.

Previously the genus *Scythropiodes* consisted of twenty-nine species worldwide. Wang &

Accepted 4 April 2019. Published 25 June 2019. Published online 6 June 2019.

① Corresponding author, E-mail: lihouhun@nankai.edu.cn

Li (2016) reviewed the genus *Scythropiodes* from China, recording nineteen species of *Scythropiodes* from China. In this paper we describe seven new species and describe the female of *S. dorsoprocessus* Wang & Li, 2016 for the first time, based on Chinese material.

Material and methods

Examined specimens were collected by light traps. Morphological terminology follows Wang & Li (2016). Genitalia were dissected and mounted by adopting the methods introduced by Li (2002). Photographs of adult specimens were taken using a Leica M250A stereo microscope. Illustrations of genitalia were prepared by using Leica DM750 microscope, and then refined with Photoshop CS6 software.

The examined specimens, including the type species, are deposited in the Insect Collection of Nankai University, Tianjin, China (NKU).

Taxonomy

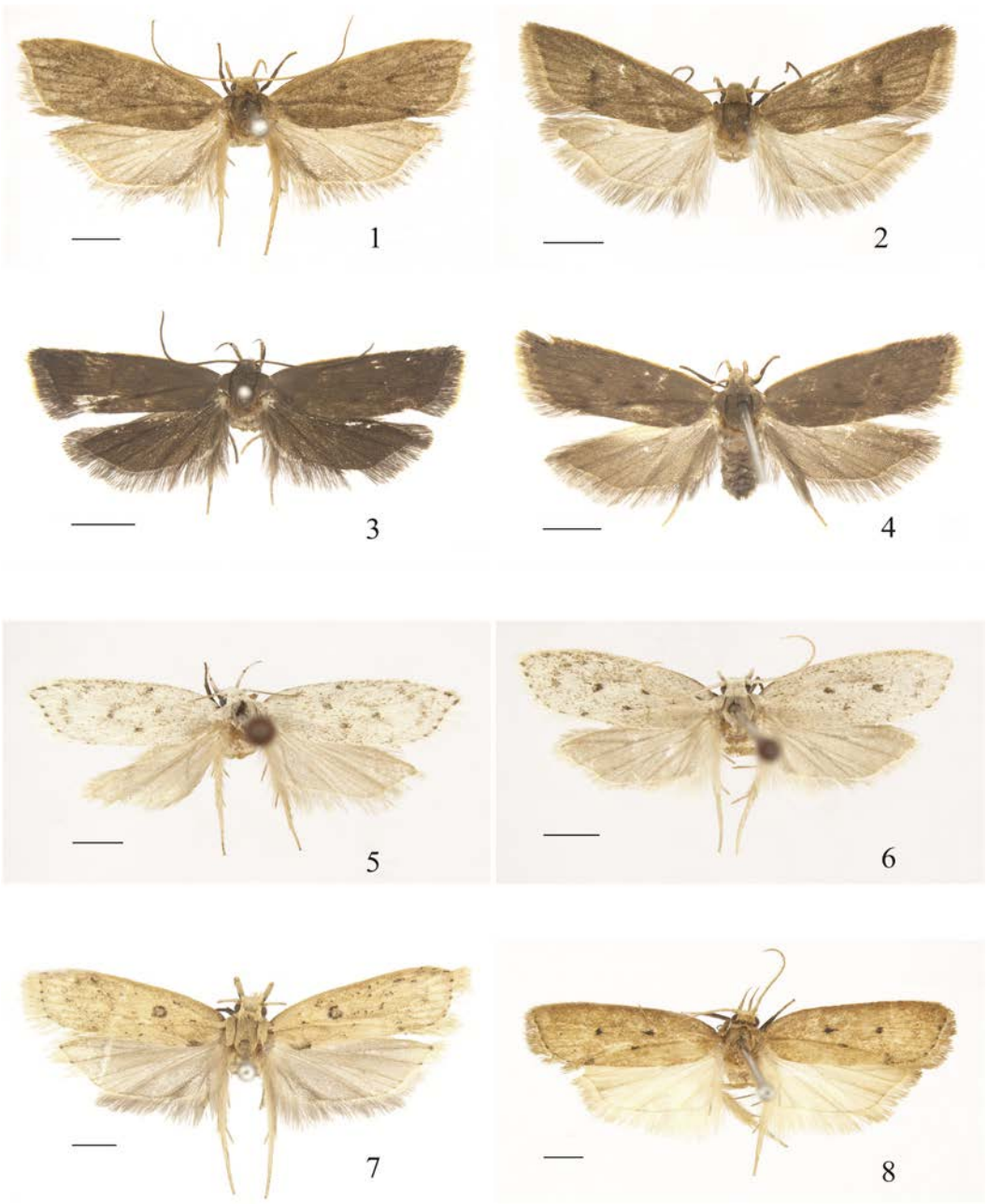
Scythropiodes Matsumura, 1931

Scythropiodes Matsumura, 1931: 1099. Type species: *Scythropiodes seriatopunctata* Matsumura, 1931 = *Protobathra leucostola* Meyrick, 1921.

1. ***Scythropiodes multicornutus* sp. nov.** (Figs. 1, 9, 16)

Adult (Fig. 1). Wingspan 15.0–18.5 mm. Head with vertex pale brown, frons whitish yellow. Antenna with scape yellowish white mixed with brown; flagellum yellowish white at base, gradually deepening to brown toward tip. Labial palpus with second palpomere yellowish white except basal 3/4 dark brown on outer surface; third palpomere yellowish white, with a few brown scales, about same length as second, pointed terminally. Thorax and tegula brown. Forewing with apex triangularly produced, termen obtusely rounded, concave below apex; greyish brown, with scattered black scales, darker in female; costal margin with basal 1/5 black, costal band orange yellow and running from base to apex; spots black: discal spot subrounded, discocellular spot subelliptical, fold with a small spot before basal 2/3 and a larger diffused spot at end; cilia pale grey mixed with dark brown, basal line yellowish white. Hindwing grey, with dense dark brown scales near tornus, basal line yellowish white. Fore- and midlegs dim yellow on dorsal surface, dark brown on ventral surface except tarsi whitish yellow at apex of each tarsomere; hindleg whitish yellow, mixed with brown on outer surface.

Male genitalia (Fig. 9). Gnathos with median process about two times length of basal arm, heavily sclerotized, pointed terminally. Valva subtriangular, broad basally, narrowed toward apex, produced to a short hornlike apical process. Costa with a small protuberance bearing dense hairs at distal 1/3; costal process large, semicircular (triangular from lateral view), with a small narrow process from its ventrobase; transtilla triangular, not connected. Sacculus wide at base, slightly narrowed distally, approximately twice as long as costa, with dense long hairs. Juxta weakly sclerotized, inverted trapezoidal, deeply concave medially on posterior margin. Vinculum widened medially, rounded posteriorly and anteriorly. Phallus slightly shorter than valva, broad at base, tapering to rounded apex, with dense microtrichia distally; cornuti consisting of a row of nine thorns.



Figures 1–8. Adults of *Scythropiodes* spp. 1. *S. multicornutus* sp. nov., paratype, ♀; 2. *S. longicornis* sp. nov., holotype, ♂; 3, 4. *S. bispinus* sp. nov.; 3. holotype, ♂; 4. paratype, ♀; 5. *S. siculiformis* sp. nov., paratype, ♀; 6. *S. dentirotatus* sp. nov., holotype, ♂; 7. *S. grandimacularis* sp. nov., holotype, ♂; 8. *S. foliiformis* sp. nov., holotype, ♂. Scale bars = 2.0 mm.

Female genitalia (Fig. 16). Apophyses posteriores about three times length of apophyses anteriores. Eighth tergum and sternum with numerous setae. Lamella postvaginalis

subquadrate, semicircularly concave on posterior margin; lamella antevaginalis sub-rectangular, wider than long. Antrum weakly sclerotized, parallel laterally. Ductus bursae about 1.3 times length of corpus bursae; ductus seminalis arising from distal 3/8 of ductus bursae. Corpus bursae oval, membranous, with dense denticles on inner surface; with two large subelliptical signa bearing denticles.

Holotype. ♂, **China,** Yunnan Province, Qinlangdang, 27.69°N, 98.27°E, Mt. Gaoligong, 380 m, 01-VI-2017, coll. Kaijian TENG *et al.*, slide No. WQY16338. **Paratypes.** 8♂3♀, same data as holotype except dated 28-V–01-VI-2017, slide No. WQY16339♀.

Distribution. China (Yunnan).

Diagnosis. This new species can be distinguished from its congeners by the semicircular costal process with a narrow ventrobasal process, and the cornuti consisting of equally sized thorns. It is similar to *S. asymmetricus* Wang & Li, 2016 and *S. taedus* Wang & Li, 2016 in having a similar forewing pattern, but can be distinguished from *S. asymmetricus* by the symmetrical valvae, which are asymmetrical in the latter species (Wang & Li 2016: 318, Fig. 32); and from *S. taedus* by the presence of cornuti, which are absent in the latter species (Wang & Li 2016: 318, Fig. 33).

Etymology. The specific epithet is derived from the Latin *multus* and *cornutus* referring to the phallus having a row of cornuti in the male genitalia.

2. ***Scythropiodes longicornis* sp. nov.** (Figs. 2, 10, 17)

Adult (Fig. 2). Wingspan 14.5–15.5 mm. Head with vertex greyish white, frons yellowish white. Antenna with scape greyish white; flagellum yellowish white basally, gradually darkening to yellowish brown toward tip. Labial palpus with second palpomere greyish white except basal 2/3 dark brown laterally; third palpomere pale yellowish brown, with a black ring basally. Thorax and tegula dark greyish brown. Forewing with apex triangularly produced, termen obliquely truncate, indistinctly concave below apex; greyish brown, paler or darker in some individuals; costal margin with basal 1/3 black, costal band orange yellow and running from base to apex; spots black: discal spot subrounded, discocellular spot subelliptical, much larger than discal spot, fold with a large spot at end, sparsely diffused to discocellular spot, somewhat forming an ill-defined stripe; cilia yellowish grey, tinged with brown. Hindwing grey; cilia pale grey, basal line whitish yellow. Foreleg dark brown; midleg greyish brown, mixed with dark brown; hindleg dim yellow.

Male genitalia (Fig. 10). Gnathos with median process as long as basal arm, narrowed toward pointed apex. Tegumen elongate, more than half length of valva, with dense long hairs (hard to remove) dorsally. Valva wide at base, narrowed to about basal 3/5, distal 2/5 produced to a narrow, curved band pointed at apex. Costal process horn-shaped, slightly less than half length of valva; transtilla lobe waist-shaped, with sparse setae of varied length. Sacculus wide basally, slightly narrowed to and terminated at ventral 3/5 of valva. Juxta U-shaped, with lateral arms narrowly banded and curved; posterior margin with a large furcate process medially, its lateral lobes digitate, apically not exceeding apex of lateral arms; anterior margin produced medially; papillary sub-lateral process set near anterior margin, bearing two or three tiny setae. Vincullum triangularly produced posteriorly, rounded anteriorly. Phallus about 1/2 length of valva, stout, with a short cornutus bearing tiny apical teeth.

Female genitalia (Fig. 17). Apophyses posteriores about 4.5 times length of apophyses

anteriores. Lamella postvaginalis a wide semi-annularly arched band, concave medially on posterior margin; lamella antevaginalis being a pair of heavily sclerotized lateral bars, extending obliquely inwards closely posterior to anterior margin. Antrum subrectangular, protruded at middle anteriorly. Ductus bursae membranous, slightly longer than corpus bursae, gradually narrowed, coiled distally, weakly sclerotized before corpus bursae; ductus seminalis arising from middle of ductus bursae. Corpus bursae oval, membranous; signa consisting of two overlapped semielliptical plates with dense denticles on inner surface.

Holotype. ♂, **China,** Tibet, Pailong Town, 30.01°N, 95.00°E, Nyingchi County, 2031 m, 18-VIII-2018, coll. Mujie QI, genitalia slide No. WQY16347. **Paratypes.** 1♂, same data as holotype; 4♂, Tongmai Town, 30.10° N, 95.08° E, Bomi County, 2029 m, 16-VIII-2018, coll. Mujie QI, slide No. WQY16344; 6♂, Yigong Town, 32.97° N, 104.10° E, Bomi County, 2230 m, 04–05-VIII-2017, coll. Mujie QI & Xiaofei YANG, slide No. WQY16348; 2♂, 80 K, 29.66° N, 95.49° E, Mêdog County, 2059–2089 m, 07–19-VIII-2017, coll. Mujie QI & Xiaofei YANG, slide No. WQY16346; 2♀, 80 K, Mêdog County, 2076 m, 28-VII–09-VIII-2018, coll. Mujie QI, slide No. WQY16345.

Distribution. China (Tibet).

Diagnosis. This new species can be distinguished from its congeners by the valva with distal 2/5 produced to a narrow, curved band pointed at apex and a large horn-shaped costal process. It is similar to *S. dorsoprocessus* Wang & Li, 2016 in having a similar forewing pattern, but can be further distinguished from the latter by the valva without a process bearing a tuft of long scales, which is present in the latter species, and the phallus with a rod-shaped cornutus in the male genitalia, which is S-shaped in the latter species (Wang & Li 2016: 317, Fig. 26).

Etymology. The specific epithet is derived from the Latin *longicornis*, referring to the long, horned-shaped costal process in the male genitalia.

3. ***Scythropiodes dorsoprocessus* Wang & Li, 2016** (Fig. 18)

Scythropiodes dorsoprocessus Wang & Li, 2016: 310. TL: China (Guangxi). TD: NKU.

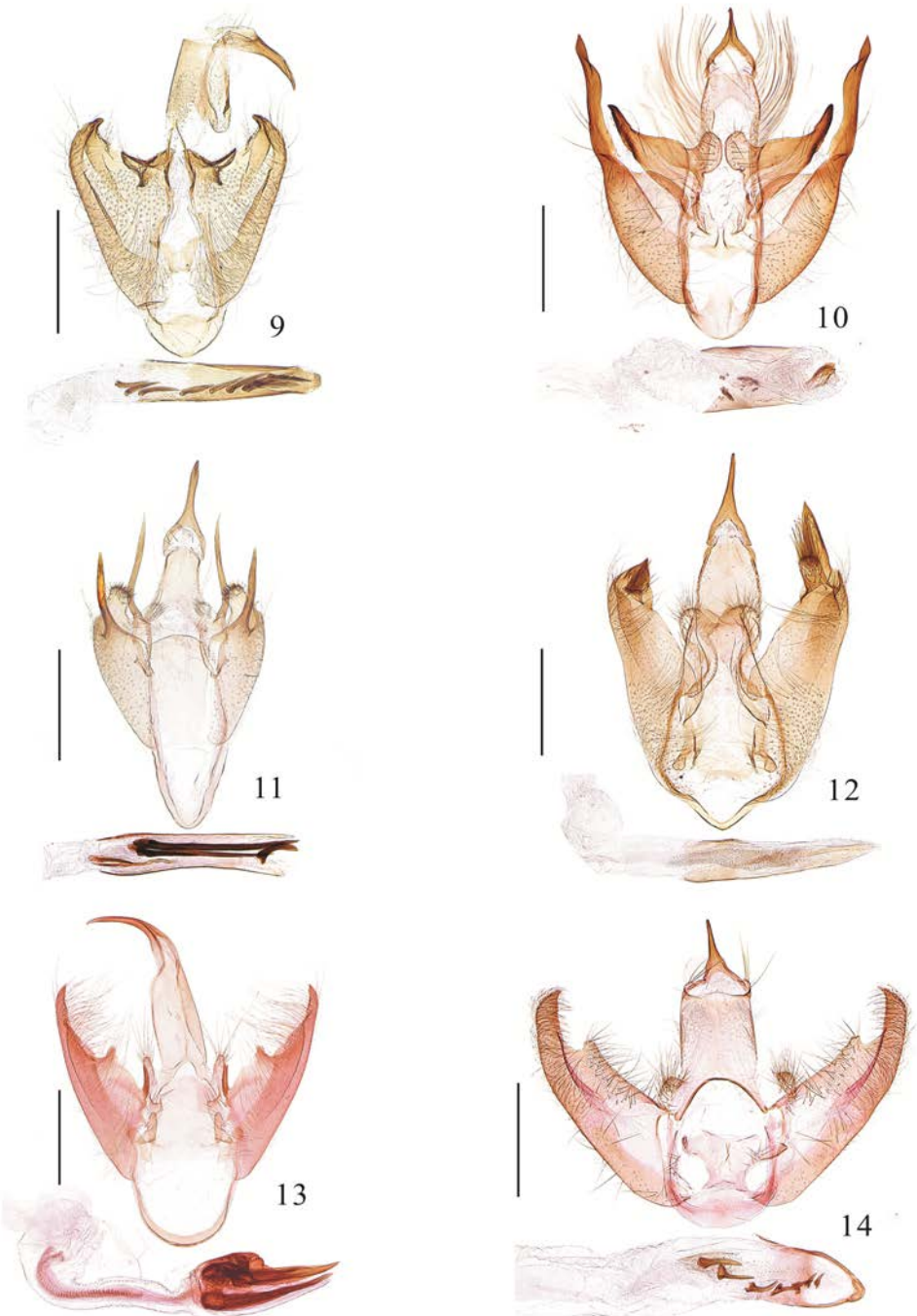
Female genitalia (Fig. 18). Apophyses posteriores about 2.4 times length of apophyses anteriores. Eighth tergum with anterior margin protruded rhombically, heavily sclerotized. Seventh abdomen with a pair of rounded sclerotized plates composed of dense extremely tiny spines postero-laterally. Antrum funnel-shaped, membranous. Ductus bursae membranous, narrow basally, expanded toward anterior end; ductus seminalis arising from anterior 2/5 of ductus bursae, dilated and oval medially. Corpus bursae ovate.

Specimens examined. 5♂, **China,** Hainan Province, Wuzhishan National Nature Reserve, 738 m, 29-II–03-III-2016, coll. Qingyun WANG *et al.*; 7♂5♀, Wuzhishan National Nature Reserve, 738 m, 22–27-VII-2016, coll. Xia BAI *et al.*; 2♂, Bawangling National Nature Reserve, 161 m, 12-III-2016, coll. Qingyun WANG *et al.*; 1♀, Mt. Qixian, Baoting County, 258 m, 24-XII-2017, coll. Mujie QI & Shuai YU.

Distribution. China (Guangxi, Hainan).

Diagnosis. *Scythropiodes dorsoprocessus* is characterized in the male genitalia by the valva with a stout thumbed process bearing a tuft of long scales. It is superficially similar to *S. longicornis* sp. nov., and the differences between them are stated in the preceding species.

Notes. The female of this species is described here for the first time.



Figures 9–14. Male genitalia of *Scythropiodes* spp. 9. *S. multicornutus* sp. nov., holotype, genitalia slide No. WQY16338; 10. *S. longicornis* sp. nov., holotype, genitalia slide No. WQY16347; 11. *S. bispinus* sp. nov., holotype, genitalia slide No. WQY16342; 12. *S. siculiformis* sp. nov., holotype, genitalia slide No. WQY16349; 13. *S. dentirotatus* sp. nov., holotype, genitalia slide No. WQY16143; 14. *S. grandimacularis* sp. nov., holotype, genitalia slide No. WQY16369. Scale bars = 0.5 mm.

4. ***Scythropiodes bispinus* sp. nov.** (Figs. 3, 4, 11, 19)

Holotype. ♂, **China,** Yunnan Province, Xiajinchang Town, 23.17°N, 104.80°E, Malipo County, 1470 m, 28-VII-2016, coll. Kaijian TENG *et al.*, slide No. WQY16342. **Paratypes.** 5♂19♀, same data as holotype except dated 26–29-VII-2016, slide Nos. WQY16153♂, WQY16153♀.

Diagnosis. This new species is similar to *S. oncinius* Park & Wu, 1997 in both the ground color and the markings on the forewing, but can be separated in the male genitalia by the valva with a square process apically, and the phallus without any process distally; and in the female genitalia by lacking a signum. In *S. oncinius*, the valva has a digitate process apically, and the phallus has a hook-shaped process distally in the male genitalia (Wang & Li 2016: 317, Fig. 28); and the signa are present in the female genitalia (Wang & Li 2016: 320, Fig. 40).

Adult (Figs. 3, 4). Wingspan 12.5–16.5 mm. Head with vertex dark greyish brown, frons yellow. Antenna dark brown except scape and base of flagellum yellowish white ventrally. Labial palpus with second palpomere yellowish white except dark brown on outer surface and on dorsal half of inner surface from basal 1/3 to 5/6; third palpomere pale yellow on ventral surface, dark brown on dorsal surface except basal 1/6 pale yellow, with a black ring at base. Thorax and tegula blackish brown. Forewing with apex obtusely rounded, termen obliquely truncate; blackish brown; costal band orange yellow, reaching before apex; spots black: discal and discocellular subrounded, fold with a spot beyond basal 2/3 and a diffused spot at end; terminal dots distinct; cilia blackish brown except terminally yellow along termen. Hindwing concolorous with forewing. Fore- and midlegs yellowish white on dorsal surface, dark brown on ventral surface except tarsi yellow at apex of each tarsomere; hindleg dark brown on dorsal surface except tarsus yellow at apex of each tarsomere, yellow on ventral surface.

Variations. Female body paler than male; wings brown (Fig. 4).

Male genitalia (Fig. 11). Gnathos with median process about three times longer than basal arm, acute apically. Valva relatively short, sub-rectangular, with a large square distal process bearing short strong apical setae. Costal process being a long and curved spine, almost as long as valva; transtilla lobes papillary, bearing dense setae of different length. Sacculus produced to a large apical spine, shorter than costal process. Vincullum narrow, rounded anteriorly. Juxta rectangular, longer than wide, about 5/7 length of valva, obtusely rounded on posterior margin. Phallus almost uniformly wide; cornuti consisting of two long and four short, strongly sclerotized thorns, two longer thorns more than 3/4 length of phallus.

Female genitalia (Fig. 19). Apophyses posteriores about 2.5 times length of apophyses anteriores. Eighth tergum with anterior margin protruded subtriangularly, heavily sclerotized. Lamella antevaginalis weakly sclerotized, subrectangular. Ductus bursae weakly sclerotized, about 1/2 length of corpus bursae, curved at middle, with distal 2/3 bearing dense microtrichia on inner wall; ductus seminalis arising from posterior end of corpus bursae, semi-ovally dilated medially. Corpus bursae pyriform, wrinkled vertically on basal half.

Distribution. China (Yunnan).

Etymology. This specific epithet is derived from the Latin *bi-* and *spinus*, referring to the long spine-shaped costal process and the apical spine of the cucullus in the male genitalia.

5. ***Scythropiodes siculiformis* sp. nov.** (Figs. 5, 12, 20)

Adult (Fig. 5). Wingspan 14.0–17.0 mm. Head white. Antenna with scape white;

flagellum white, with dark brown annulations, with dense short cilia ventrally. Labial palpus with second palpomere white except basal half dark brown on outer surface; third palpomere white except ventral surface brown, with a black ring at base. Thorax and tegula greyish white. Forewing with costal margin arched, apex produced triangularly, termen obliquely rounded and concave below apex; white with brown scales; costal margin with basal 1/5 black, with a rounded black spot below basal 3/7; discal and discocellular spots dark brown, subrounded; fold with a dark brown spot at middle; subterminal fascia represented by dark brown spots, running from below distal 2/7 of costal margin to tornus, arched outwards medially; rounded black dots running along distal part of costal margin and termen; cilia white. Hindwing pale grey; cilia pale grey basally, whitish yellow distally. Fore- and midlegs whitish yellow on dorsal surface, black on ventral surface except tarsi yellow at apex of each tarsomere; hindleg dim yellow.

Male genitalia (Fig. 12). Gnathos with median process about three times length of basal arm, tapering to apex. Valva wide basally, gradually narrowed toward apex; valvae asymmetrical: Left valva produced to a triangular distal process bearing dense tiny spines, pointed at apex, with a short protuberance bearing dense long setae at about distal 1/7. Right valva produced to a dagger-shaped distal process bearing dense tiny spines on distal half dorsally, with a thumb-like process bearing dense long setae at about distal 1/3. Transtilla S-shaped, band-like basally, semicircularly dilated distally, bearing numerous setae posteriorly and laterally, joined medially. Sacculus broad at base, narrowed toward apex, with dense fine hairs. Juxta weakly sclerotized, slightly concave at middle on both posterior and anterior margins; lateral arms curved, with spoon-like lateral lobes directed obliquely ventrad. Vincullum narrow, V-shaped anteriorly. Phallus about same length of valva, sword-shaped, with dense tiny thorns distally; endophallus with thick micro spines inside, running from base to 2/3; cornutus long, rod-shaped, extending from middle to apex.

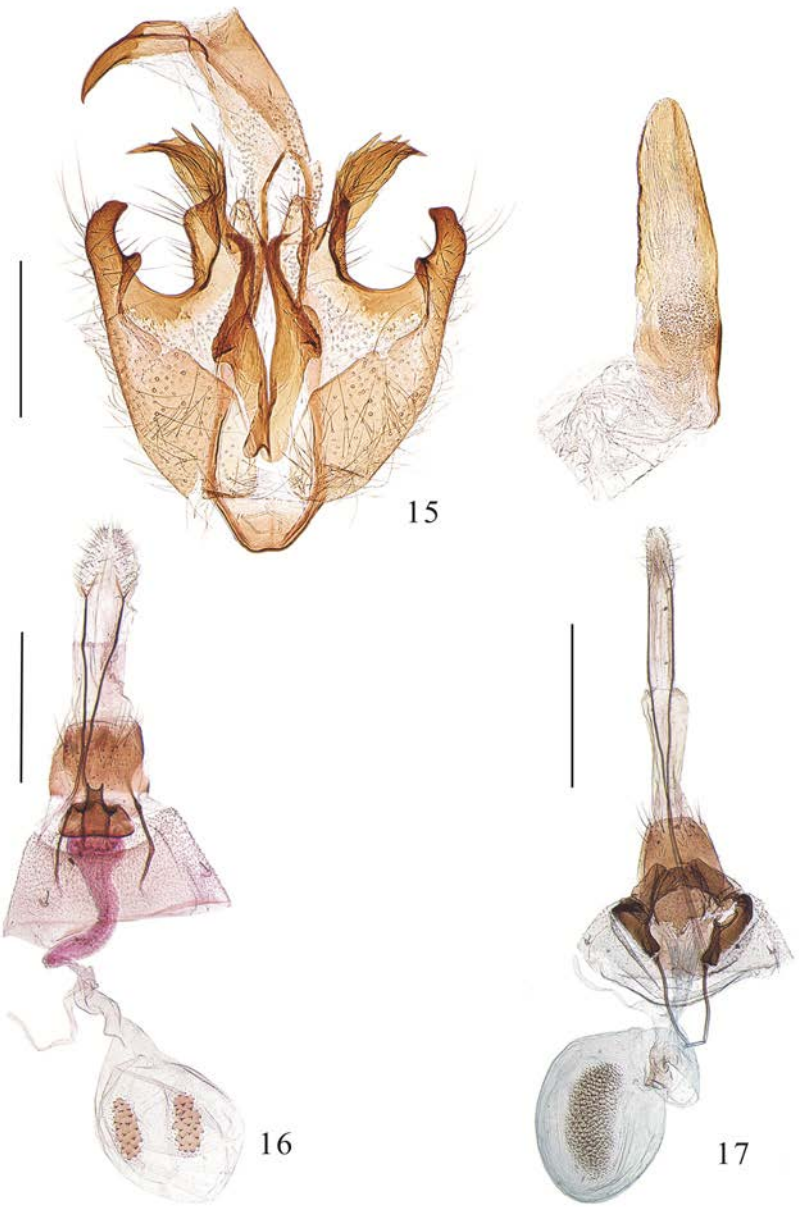
Female genitalia (Fig. 20). Apophyses posteriores about 3 times length of apophyses anteriores. Eighth tergum with anterior margin protruded semiovally, heavily sclerotized. Lamella postvaginalis sub-square; lamella antevaginalis inverted subtrapezoidal, shallowly concave medially on posterior margin. Ductus bursae membranous, slightly longer than corpus bursae; ductus seminalis arising from distal end of ductus bursae, with dense tiny prickles on inner surface. Corpus bursae pyriform; signa consisting of two teardrop-shaped plates bearing denticles on inner surface.

Holotype. ♂, **China,** Yunnan Province, Xiajinchang Town, 23.17°N, 104.80°E, Malipo County, 1470 m, 27-VII-2016, coll. Kaijian TENG *et al.*, slide No. WQY16349. **Paratypes.** 3♂1♀, same data as holotype except dated 27–29-VII-2016, slide No. WQY16350♀.

Distribution. China (Yunnan).

Diagnosis. This new species can be distinguished from its congeners in the male genitalia by the asymmetrical valvae with the left valva produced to a triangular distal process and the right valva produced to a dagger-shaped distal process, the S-shaped transtilla semicircularly dilated distally, the juxta with lateral arms carrying spoon-like lateral lobes, and the phallus with a single long rod-shaped cornutus. The new species is similar to *S. aculeiformus* Wang & Li, 2016, *S. hamatellus* Park & Wu, 1997, *S. jiulianae* Park & Wu, 1997 and *S. dentirotatus* sp. nov. in the forewing patterns, but can be distinguished from each of them by the above-mentioned characters in the male genitalia.

Etymology. The specific epithet is from the Latin *siculiformis*, referring to the dagger-shaped distal process of the right valva in the male genitalia.



Figures 15–17. Genitalia of *Scythropiodes* spp. 15. Male genitalia of *Scythropiodes foliiformis* sp. nov., holotype, genitalia slide No. WQY16370; 16, 17. Female genitalia. 16. *S. multicornutus* sp. nov., paratype, genitalia slide No. WQY16339; 17. *S. longicornis* sp. nov., paratype, genitalia slide No. WQY16345. Scale bars = 0.5 mm (Fig. 15); 1.0 mm (Figs. 16, 17).

6. ***Scythropiodes dentirotatus* sp. nov.** (Figs. 6, 13, 21)

Adult (Fig. 6). Wingspan 15.5–20.0 mm. Head snowy white. Antenna white; flagellum

with dense short cilia ventrally. Labial palpus with second palpomere white except basal 3/4 dark brown on outer surface; third palpomere white except dark brown terminally, with a black ring at base. Thorax and tegula dirty white except tegula dark brown terminally. Forewing with apex obtuse, termen oblique; white with dense brown scales, with a black basal spot beyond cubitus; costal margin with basal 1/5 greyish brown; discal and discocellular spots black, rounded; fold with two black spots, one at distal 2/5 and another at distal end; subterminal fascia represented by loosely connected brown spots, extending from below distal 3/8 of costal margin to lower corner of discal cell, arched outwards medially; dark brown dots running along distal part of costal margin through termen to tornus; cilia white. Hindwing pale grey; cilia whitish yellow. Foreleg dark brown; midleg greyish white, speckled with dark brown; hindleg yellowish white.

Male genitalia (Fig. 13). Gnathos with median process elongate, about 2.5 times length of basal arm. Valva with basal 3/5 subparallel, distal 2/5 narrowed to pointed apex. Costa produced to a short digitate process apically; costal process being a heavily sclerotized thorn. Transtilla weakly sclerotized, widened medially; lateral lobes digitate, concave on inner margin near base, bearing dense setae. Sacculus with basal 3/5 uniformly wide, wider than half width of valva, distal 2/5 narrowed and produced to a spine slightly curved inwards. Juxta weakly sclerotized, slightly concave on anterior margin; lateral arms subtriangular, with sparse setae on inner margin. Vincullum narrowly banded. Phallus about two times longer than valva, basal 3/5 weakly sclerotized, distal 2/5 heavily sclerotized; endophallus with dense denticles inside from basal 1/10 to 3/5; cornuti consisting of two heavily sclerotized elongate thorns of different length, extending from distal 2/5 to apex.

Female genitalia (Fig. 21). Apophyses posteriores more than 3 times longer than apophyses anteriores. Eighth tergum with anterior margin greatly produced to a cordiform shape, heavily sclerotized. Antrum cup-shaped, membranous. Ductus bursae slightly shorter than corpus bursae, with dense tiny spines on inner wall; ductus seminalis arising from anterior end, as wide as ductus bursae, with tiny spines on inner wall basally and much stouter spines on one side of inner wall distally. Corpus bursae long pear-shaped, with denticles on inner surface; signa consisting of two tooth-wheeled plates with 8–9 radiated arms.

Holotype. ♂, **China,** Sichuan Province, Bifengxia, 30.07° N, 102.97° E, Ya'an City, 1115 m, 27-VI-2017, coll. Kaijian TENG & Xiaofei YANG, slide No. WQY16143. **Paratypes.** 2♂1♀, same data as for holotype except dated 27–28-VI-2016, slide No. WQY16144♀.

Distribution. China (Sichuan).

Diagnosis. This new species can be separated from its congeners by having a heavily sclerotized thorn-like costal process in the male genitalia. It is more similar to *S. grandimacularis* sp. nov. in the shape of the valva, but can be distinguished by the cornuti consisting of two elongate thorns, which are represented by eight short spines in the latter species. In addition, the differently shaped juxta can further separate these two species.

Etymology. The specific epithet stems from the Latin *denti-* and *rotatus*, referring to the two tooth-wheeled signa in the female genitalia.

7. ***Scythropiodes grandimacularis* sp. nov.** (Figs. 7, 14)

Adult (Fig. 7). Wingspan 15.5–20.5 mm. Head yellow. Antenna yellowish white on scape and on base of flagellum, gradually deepening to grey toward tip. Labial palpus yellow, second

palpomere with basal half dark brown on outer surface, third palpomere with a black ring at base and with a longitudinal discontinuous line on distal 3/5 of ventral surface. Thorax and tegula yellow mixed pale brown. Forewing apex obtuse, termen obliquely obtuse; greyish white mixed with sparse brown scales, with scattered tiny black dots formed by black scales; discal spot round or ovate, black; discocellar spot represented by a tiny black dot formed by black scales; fold with a small black dot beyond basal 2/3, with a larger diffused black spot at end; dorsum with a large black spot at basal 1/4; subterminal fascia represented by loosely connected brown spots, extending from below distal 1/4 of costal margin to lower corner of discal cell, greatly arched outwards medially; rounded black dots along distal part of costal margin and termen; cilia yellowish white, interspersed with grey. Hindwing grey; cilia greyish white, dark grey from base to tornus. Foreleg white on dorsal surface, dark brown on ventral surface; midleg with femur and tibia greyish white, tarsus pale brown; hindleg yellowish white.

Male genitalia (Fig. 14). Gnathos with median process beak-shaped, narrowed to pointed apex, about two times length of basal arm. Tegumen with a small digitate process from posterolateral corner and bearing long setae. Valva wide at base, slightly narrowed to beyond basal 2/3, narrowed to apex distally. Costa produced to a papillary process apically; transtilla lobes semi-oval, covered with thick hairs. Sacculus subparallel, extended elongately, about 2 times length of costa, slightly produced dorso-medially, with clustered hairs on distal half, with an apical spine curving inwards. Juxta inverted trapezoidal, semicircularly concave laterally, slightly concave medially on posterior margin; lateral lobes digitate, setose, extending outwards. Vincullum slightly widened medially, arched on anterior margin. Phallus about half length of valva, basal half equal in width, distal half slightly narrowed, rounded apically; endophallus with bushy microtrichia inside; cornuti consisting of eight thorns of unequal size.

Female unknown.

Holotype. ♂, **China,** Hainan Province, Yinggezui Administration, 19.05° N, 109.56° E, Yinggeling, 599 m, 28-VII-2017, coll. Xia BAI *et al.*, slide No. WQY16369. **Paratypes.** 2♂, same data as holotype except dated 28–29-VII-2017; 2♂, Shuiman Town, 18.88° N, 109.67° E, Wuzhishan City, 690 m, 06-XI-2016–6-VIII-2017, coll. Xia BAI *et al.*; 1♂, Mingfeng Valley, 18.74° N, 108.84° E, Jianfengling, 954 m, 10-VIII-2017, coll. Xia BAI *et al.*

Distribution. China (Hainan).

Diagnosis. This new species is similar *S. issikii* (Takahashi, 1930) by having similar markings on the forewing, but it can be differentiated by the costa produced to a papillary apical process, the elongately extended sacculus having an apical spine, and the phallus having 8 cornuti in the male genitalia (Fig. 14). In *S. issikii*, the valva has no apical spine, the costa is not produced to a process, and the phallus has 4–5 cornuti in the male genitalia (Wang & Li 2016: 317, Fig. 30). This new species is also similar to *S. aspasta* (Meyrick, 1908) in the shape of the valva in the male genitalia, but it can be distinguished from the latter by the forewing lacking a discocellular spot, and the juxta concave on the posterior margin in the male genitalia. In *S. aspasta*, the forewing has a discocellular spot, and the juxta is rounded on posterior margin (Clarke 1955: Pl. 228, Figs. 1–1b).

Etymology. The specific epithet is derived from the Latin *grandi-* and *macularis*, referring to the relatively large discal spot of the forewing.

Figures 18–22. Female genitalia of *Scythropiodes* spp. 18. *S. dorsoprocessus* Wang & Li, genitalia slide No. WQY16374; 19. *S. bispinus* sp. nov., paratype, genitalia slide No. WQY16154; 20. *S. siculiformis* sp. nov., paratype, genitalia slide No. WQY16350; 21. *S. dentirotatus* sp. nov., paratype, genitalia slide No. WQY16144; 22. *S. foliiformis* sp. nov. paratype, genitalia slide No. WQY16371. Scale bars = 1.0 mm.

8. ***Scythropiodes foliiformis* sp. nov.** (Figs. 8, 15, 22)

Adult (Fig. 8). Wingspan 18.0–22.0 mm. Head earth yellow. Antenna with scape whitish yellow; flagellum yellowish white at base, gradually darkening to brown toward terminal point. Labial palpus with second palpomere yellowish white except basal 3/4 dark brown on outer surface; third palpomere pale yellow. Thorax and tegula pale yellowish brown. Forewing with

apex obtuse, termen obliquely obtuse; yellowish brown, paler or darker in some individuals, with a few dark brown scales scattered on distal half; discal and discocellular spots black; fold with a smaller black spot beyond middle, with a diffused black spot at distal end; subterminal fascia represented by loosely connected brown spots, extending from below and before distal 1/4 of costal margin to join the spot at end of fold, arched outwards medially; black dots along termen to tornus; cilia pale grey, tinged with dark brown. Hindwing yellowish grey; cilia yellowish white, tinged with grey. Foreleg dark brown; midleg yellowish brown, femur speckled with yellow; hindleg yellowish white.

Male genitalia (Fig. 15). Gnathos with median process beak shaped, as long as basal arm, hooked and pointed distally. Valva with basal 2/3 subtriangular, distal 1/3 concave medially, forming two large processes: costa produced to a foliate dorsoapical process bearing large apical spines, with a large semicircular plate from its ventral half; ventroapical process slightly narrowed to truncate apex, curving inwards, shorter than dorsoapical process. Transtilla lobes membranous, digitate, bearing setae. Sacculus broadened basally, distinctly narrowed distally, with a corniform process apically. Juxta anteriorly joined and rounded, with a papillary process ventro-medially; lateral processes slightly widened to about middle where angle forms, distal half horn-shaped, narrowed to pointed apex curving outwards. Vincullum widened medially, almost straight on anterior margin. Phallus about same length of valva, blunt apically, with dense spinules on inner wall from base to 2/5.

Female genitalia (Fig. 22). Apophyses posteriores more than 2 times longer than apophyses anteriores. Lamella antevaginalis heavily sclerotized, sub-trapezoidal, with horn-shaped postero-lateral process. Antrum subtrapezoidal, with anterior margin rounded, covered with dense minute granules on inner surface. Ductus bursae membranous, about half length of corpus bursae, with dense tiny granules inside on posterior 5/8; ductus seminalis arising from anterior end of ductus bursae, dilated distally. Corpus bursae oval, with a pair of subelliptical signa, bearing dense tiny denticles.

Holotype. ♂, **China,** Tibet, 80 K, 29.66° N, 95.49° E, Mêdog County, 2089 m, 19-VIII-2017, coll. Mujie QI & Xiaofei YANG, slide no. WQY16370. **Paratypes.** 3♀, same data as for holotype, slide no. WQY16371; 1♂2♀, 2076 m, 28-VII–08-VIII-2018, coll. Mujie QI, other same data as holotype, slide no. WQY16372♂.

Distribution. China (Tibet).

Diagnosis. This new species is similar to *S. malivora* (Meyrick, 1930) by having a similar forewing pattern, but it differs from the latter in the male genitalia by the valva with a dorso- and a ventroapical processes, and the sacculus with a corniform apical process; and in the female genitalia by the presence of a lamella antevaginalis. In *S. malivora*, the valva has one apical process medially, and the sacculus lacks an apical process in the male genitalia (Wang & Li 2016: 317, Fig. 29); and the lamella antevaginalis is absent in the female genitalia (Wang & Li 2016: 320, Fig. 41).

Etymology. The specific epithet stems from the Latin *foliiformis*, referring to the foliated dorsoapical process in the male genitalia.

Acknowledgements

We express our cordial thanks to those who participated in the field collection. This

research was supported by the National Natural Science Foundation of China (31872267).

References

Clarke JFG. 1955. Xyloryctidae. *In*: Clarke JFG (Ed.), *Catalogue of the type specimens of Microlepidoptera in the British Museum* (*Natural History*) *described by Edward Meyrick. Vol. 2*. Trustees of the British Museum, London, pp. 397–506.

Heikkilä M, Mutanen M, Kekkonen M & Kaila L. 2014. Morphology reinforces proposed molecular phylogenetic affinities: a revised classification for Gelechioidea (Lepidoptera). *Cladistics*, 30: 563–589. http://dx.doi.org/10.1111/cla.12064

Kaila L, Mutanen M & Nyman T. 2011. Phylogeny of the mega-diverse Gelechioidea (Lepidoptera): Adaptations and determinants of success. *Molecular Phylogenetics and Evolution*, 61: 801–809. http://dx.doi.org/10.1016/j.ympev.2011.08.016

Li HH. 2002. *The Gelechiidae of China* (*I*) (*Lepidoptera*: *Gelechioidea*). Nankai University Press, Tianjin, 504 pp.

Lvovsky AL. 1996. Composition of the genus *Odites* Wlsm. and its position in the classification of the Gelechioidea (Lepidoptera). *Entomologicheskoe Obozrenie*, 75: 650–659.

Matsumura S. 1931. *6000 Illustrated Insects of Japan-Empire*. Toko-Shoi, Tokyo, 1497+191 pp.

Park KT & Wu CS. 1997. Genus *Scythropiodes* Matsumura in China and Korea (Lepidoptera, Lecithoceridae), with description of seven new species. *Insecta Koreana*, 14: 29–42.

Sohn JC, Regier JC, Mitter C, Adamski D, Landry JF, Heikkilä M, Park KT, Harrison T, Mitter K, Zwick A, Kawahara AY, Cho S, Cummings MP & Schmitz P. 2016. Phylogeny and feeding trait evolution of the mega-diverse Gelechioidea (Lepidoptera: Obtectomera): new insight from 19 nuclear genes. *Systematic Entomology*, 41(1): 112–132. http://dx.doi.org/10.1111/syen.12143

Wang QY & Li HH. 2016. Review of the genus *Scythropiodes* Matsumura, 1931 (Lepidoptera, Lecithoceridae, Oditinae) from China, with a checklist of the world. *Zootaxa*, 4132(3): 301–329. http://doi.org/10.11646/zootaxa.4132.3.1