

Review

Revision of *Rhopalovalva* Kuznetsov, 1964 (Lepidoptera: Tortricidae: Olethreutinae) from China

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Abstract: The genus *Rhopalovalva* Kuznetsov, 1964 belongs to Eucosmini within the family Tortricidae with larvae feeding on the plants of Fagaceae, Leguminosae, Convolvulaceae and Aceraceae. In this paper, *Rhopalovalva* is revised from China, with two species (*Rhopalovalva spinata* sp. nov. and *Rhopalovalva stilliformis* sp. nov.) described as new to science. Photographs of the adults and male genitalia of these two new species are given. A key to Chinese species of *Rhopalovalva* Kuznetsov is provided based on the characters of the male genitalia.

Keywords: Olethreutinae; Eucosmini; *Rhopalovalva*; key; new species; China



Citation: Zhang, A.; Bai, X. Revision of *Rhopalovalva* Kuznetsov, 1964 (Lepidoptera: Tortricidae: Olethreutinae) from China. *Forests* **2022**, *13*, 187. <https://doi.org/10.3390/f13020187>

Academic Editors: Bong-Kyu Byun and Youngseuk Park

Received: 16 December 2021

Accepted: 21 January 2022

Published: 26 January 2022

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1. Introduction

Tortricidae is one of the largest Microlepidopteran families, with 11,365 described species worldwide [1]. A division into three subfamilies, Tortricinae, Chlidanotinae and Olethreutinae, has been generally accepted, though only the latter two are natural groups defined by reliable characters [2]. The majority of tortricid caterpillars are leafrollers, but internal feeding is found in all subfamilies. Larvae boring in fruit, shoots, stems or roots are particularly prevalent in the Olethreutinae [3].

Rhopalovalva Kuznetsov, 1964 belongs to the tribe Eucosmini within the family Tortricidae, which was erected with *Eudemis lascivana* Christoph, 1882 as the type species [4]. The host plants of *Rhopalovalva* spp. have been little known except four species: *Rhopalovalva lascivana* (Christoph, 1882) feeding on *Quercus mongolica* Fisch. ex Ledeb., 1850 (Fagaceae), *Rhopalovalva pulchra* (Butler, 1879) on *Q. sp.* (Fagaceae) [5–7], *Rhopalovalva grapholitana* (Caradja, 1916) on *Lespedeza bicolor* Turcz., 1840 (Leguminosae) [8] and *Ipomoea aquatica* Forsk., 1775 (Convolvulaceae) [9] and *Rhopalovalva chidorinoki* Nasu, 2021 on *Acer carpini-folium* Sieb. et Zucc., 1845 (Aceraceae) [10].

To date, the genus *Rhopalovalva* is composed of 14 species distributed in East Asia, e.g., China (Beijing, Tianjin, Hebei, Shanxi, Heilongjiang, Shanghai, Anhui, Jiangxi, Henan, Zhejiang, Shaanxi, Gansu, Ningxia, Yunnan, Guizhou, Hainan, Guangxi, Tibet, Fujian, Hunan, Taiwan, etc.), Korea (Gwangleung, Chuncheon, Pyongchang, Seolakdong, Hongcheon, Jeongseon, Pyongchang, Hwacheon, Hwenggye, Euiwang, Wonju, Yongin, Yangyang, Namyangju, Suweon, Taebaek, Namhae, Yesan, Yeosu, etc.), Japan (Hokkaido, Honshu, Shikoku, Kyushu, etc.) and Russia (Amur: Khabarovsk Krai, Priamur'e, S. Primor'e, S. Kuril Is., Maritime Territory, Zeya, etc.) [1,4–11]. In China, 11 species have been recorded as members of this genus [8,11–15]. During recent study on Olethreutine moths from Tibet Autonomous Region, two undescribed species of *Rhopalovalva* were recognized. The purpose of this paper is to revise *Rhopalovalva* from China, describe these two new species and remark on other species.

2. Materials and Methods

The study is based on examination of the specimens collected by light traps with high-voltage mercury lamp in the mountains and forests from 16 provinces (autonomous regions or municipal districts), including Beijing, Tianjin, Hebei, Shanxi, Henan, Shaanxi, Gansu, Zhejiang, Fujian, Hunan, Yunnan, Guizhou, Hainan, Guangxi, Ningxia and Tibet in China. Forewing length was measured from the outer edge of the tegula at the wing base to the outermost edge of the fringe scales at the apex. Terms for forewing pattern followed Brown and Powell [16] as refined by Baixeras [17]. The genitalia were dissected after being macerated in 10% NaOH heated in a water bath for about 10 min, stained with Eosin-Y, faded with absolute ethyl alcohol, transparent with xylene and slide-mounted with Canada balsam after washing [18].

Images of adults were photographed with a Leica M205A Stereo microscope plus Leica Application Suite 4.2 software, and photographs of genitalia were prepared with a Leica DM750 Microscope provided with the same software. The images were edited with the software Adobe Photoshop CS2.

All the examined specimens are deposited in the Insect Collections, Nankai University, Tianjin, China, except otherwise mentioned.

3. Results

3.1. Systematics of *Rhopalovalva*

Rhopalovalva Kuznetsov, 1964

Rhopalovalva Kuznetsov, 1964, *Entomol. Obozr.*, 43 (4): 883.

Type species: *Rhopalovalva lascivana* (Christoph, 1882) by original designation.

- Venation. Forewing with chorda extending from middle of R_1 – R_2 to base of R_4 ; R_4 and R_5 stalked; M-stem very weak; M_3 and CuA_1 curved. Hindwing with all veins separate except for M_3 and CuA_1 stalked to middle.
- Male genitalia. Tegumen sometimes has a pair of slender sclerites dorsolaterally. Uncus is often stick-shaped, occasionally absent; socius is simple, zonary, triangular or other shaped, hairy. Valva is broad at the base; the neck is often distinct, naked; the sacculus angle is often armed with a slender or short hairy lobe directed dorsad, but there is a hairy mound instead of a hairy lobe in *R. exartemana* and *R. chidorinoki* Nasu; cucullus varies in shape, hairy, sometimes with marginal spines, often with a ventral process or stout spine. Phallus is simple, slender; cornuti deciduous or absent.
- Female genitalia. Sternite VII is sclerotized, and posterior margin is depressed; ostium opening on the posterior margin of sternite VII; sterigma is indistinct or weakly sclerotized, surrounding ostium; the ductus bursae is slender, antrum funnel-shaped or ring-shaped; ductus seminalis originating from near the entrance of corpus bursae or middle of ductus bursae; two funnel-like or hornlike singa present.
- Distribution. Palaearctic and Oriental regions (China (Beijing, Tianjin, Hebei, Shanxi, Heilongjiang, Shanghai, Anhui, Jiangxi, Henan, Zhejiang, Shaanxi, Gansu, Ningxia, Yunnan, Guizhou, Hainan, Guangxi, Tibet, Fujian, Hunan, Taiwan, etc.), Korea, Japan (Hokkaido, Honshu, Shikoku, Kyushu, etc.) and Russia (Amur, Priamur'e, S. Primor'e, S. Kuril Is., Maritime Territory, etc.).

3.2. Key to Chinese Species of *Rhopalovalva* Kuznetsov

Key to Chinese species of *Rhopalovalva* Kuznetsov based on characters of male genitalia

1. Uncus absent	2
- Uncus present	3
2. Socii healed; cucullus somewhat parallelogram-shaped, without process ventrally	
.....	<i>R. connata</i>
- Socii paired; cucullus broad oval, with a spinous process ventrally	<i>R. spinata</i> sp. nov.
3. Cucullus without process ventrally	4
- Cucullus with a process ventrally	7
4. Uncus somewhat Y-shaped; cucullus somewhat triangular	<i>R. triangulata</i>
- Uncus club-shaped; cucullus other shaped	5
5. Cucullus obviously larger than base of valva, nearly orthogonal dorsally and blunt ventrally	6
- Cucullus about as large as base of valva, somewhat rhomboid	<i>R. rhombea</i>
6. Valva base about 1.5 times as wide as neck; socius about 2.5 times as long as uncus	<i>R. macrocuculla</i>
- Valva base about twice as wide as neck; socius slightly shorter than twice of uncus	<i>R. stilliformis</i> sp. nov.
7. A spinous process on cucullus ventrally	8
- Other shaped process on cucullus ventrally	9
8. Valva deeply concave ventrally; sacculus angle with a slender hairy lobe	<i>R. catharotorna</i>
- Valva straight ventrally; sacculus angle with a very short hairy lobe or a hairy mound	<i>R. pulchra</i>
9. Socius ovate; cucullus with a short clubbed process ventrally	<i>R. ovata</i>
- Socius zonary, long and narrow; cucullus with a slender process ventrally	10
10. Uncus with slightly broader termination; socius about as long as uncus	<i>R. orbiculata</i>
- Uncus with pointed termination; socius obviously longer than uncus	11
11. Cucullus with a slender club-shaped process	<i>R. lasciviana</i>
- Cucullus with a slender zonary process	12
12. Cucullus with process dilated apically; sacculus angle with a slightly broad lobe with termination gradually narrowed	<i>R. grapholitana</i>
- Cucullus with process not dilated apically; sacculus angle with a hairy mound	<i>R. exartemana</i>

3.3. Species of Rhopalovalva Listed

3.3.1. *Rhopalovalva stilliformis* sp. nov.

- **Diagnosis.** This species is similar to *R. macrocuculla* Zhang, Bai & Li, 2017 but can be separated by the following characteristics: Forewing has a large transverse pale yellowish stilliform patch located on the outer side of cell with the pointed end to the termen; tegumen bearing a pair of slender sclerites dorsolaterally, slightly longer than the uncus; socius is semi-elliptic, slightly shorter than twice the size of the uncus; valva base is about twice as wide as the neck in the male genitalia. In the latter species, a stilliform patch is absent on the forewing; a pair of slender sclerites on the tegumen are as long as the uncus; the socius is broad and long, with nearly pointed termination and is about 2.5 times as long as the uncus; the valva base is about 1.5 times as wide as the neck in the male genitalia.
- **Description.** Adult (Figure 1a): Head: Vertex grayish yellow mixed with brown scales tufted between antennae; frons white. Antenna is simple and dark gray. Labial palpus with outer surface gray, inner surface white; the second segment has pale brown termination; the third segment is relatively long, porrect and concealed in long scales of the second segment. Thorax: Dorsum and tegula with basal half grayish yellow and white end. Forewing length 6.0 mm. Forewing elongates triangularly, and apex is yellowish brown and protruded; termen with black line; ground color pale yellow; basal and subbasal fasciae fused to form a yellowish brown basal patch mixed with pale yellow scales, extending from costal one-third to two-fifths of dorsum, protruding medially on outer margin; median fascia yellowish brown, extending from costal half to before tornus; ocelloid patch grayish yellow, semi-elliptic, armed with a small yellowish brown spot on the anterior part; a large transverse stilliform patch is located

on the outer side of the cell with the pointed end to the termen, a small elongate triangular pale yellow patch below it; costa with eight pairs of white strigulae from base to apex: strigulae 1–3 indistinct; strigulae 4 on costal half; strigulae 5–8 confluent downward and extending to termen; two silvery streaks from before strigulae 5 and 6, respectively, and extending downward obliquely; cilia yellowish mixed with little brown. Hindwing and cilia dark gray. *Abdomen*: Male genitalia (Figure 1c). Tegumen bearing a pair of slender sclerites dorsolaterally, slightly longer than uncus. Uncus moderately long, slender club-shaped, narrowed to apex. Socius semi-elliptic, hairy, slightly shorter than twice of uncus. Valva broad at base, distinctly concave ventrally and produced into a distinct neck; valva base about twice as wide as the neck; sacculus angle with a slender curving hairy lobe directed dorsad; cucullus hairy, larger than the base of the valva, nearly orthogonal dorsally, blunt ventrally. Phallus slender, tubular, gradually narrowed to end, curving ventrad, with a tapering end; cornuti undetected.

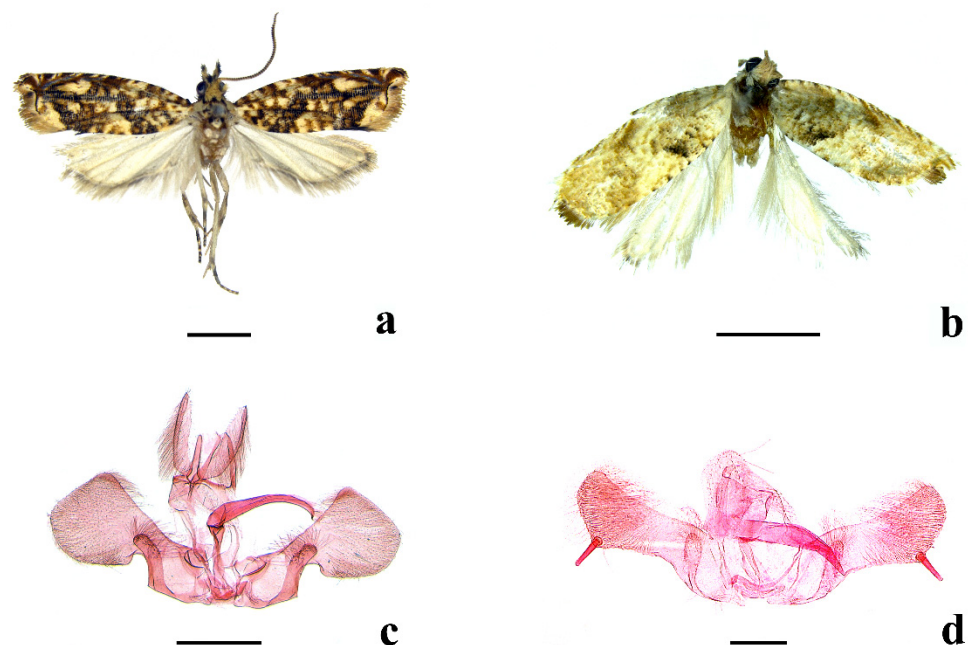


Figure 1. *Rhopalovalva* spp. (a). Adult of *R. stilliformis* sp. nov., holotype; (b). Adult of *R. spinata* sp. nov., holotype; (c). Male genitalia of *R. stilliformis* sp. nov., holotype, slide no. ZAH19011; (d). Male genitalia of *R. spinata* sp. nov., holotype, slide no. ZAH19014 (Scale bars: a,b = 2 mm; c = 0.5 mm; d = 0.2 mm).

Female unknown.

Holotype ♂, CHINA: Motuo County 80 K (29.66° N, 95.49° E), Tibet Autonomous Region, alt. 2059 m, 7 August 2017, leg. Qi M.J. & Yang X.F., genitalia slide no. ZAH19011.

- Distribution. China (Tibet).
- Etymology. The specific name is derived from the Latin *stilliformis* (=stilliform), indicating forewing with a large transverse stilliform patch located on the outer side of the cell.

3.3.2. *Rhopalovalva spinata* sp. nov.

- Diagnosis. This species is similar to *R. connata* Zhang, Bai & Li, 2017 in uncus absent, but they can be easily distinguished by forewing with unprotruded apex and distinct basal patch, median fascia and ocelloid patch, socii paired and broad triangular, sacculus angle with a slender hairy lobe and cucullus broad oval, with a stout spine ventrally in the male genitalia. In the latter species, the apex of the forewing is protruded, falcate; the basal patch, median fascia and ocelloid patch are indistinct; the

socii are fused and produced into a rectangular sclerite, a very broad and short hairy lobe is located on sacculus angle; cucullus is somewhat parallelogram-shaped and without a stout spine ventrally in the male genitalia.

- Description. Male (Figure 1b). Head: Vertex with grayish yellow scales tufted between antennae; frons white. Antenna with scape dark gray, and other parts lost. Labial palpus lost. Thorax: Dorsum and tegula grayish yellow. Forewing length 4.0 mm; nearly rectangular; apex unprotruded; ground color gray, sprinkled with transverse streaks; basal patch pale yellow, extending from costal one-third to one-third of dorsum, protruding medially on outer margin; median fascia represented by a short yellow streak from the costal half to the anterior angle of the cell; ocelloid patch concolor with ground color; costa with nine pairs of white strigulae: strigulae 1–4 wide, between base and the point where Sc meets costa; strigulae 5–9 slender, 5 and 6 between Sc and R₁; distal three pairs distinct, distributed between pairs of veins R₁–R₂, R₂–R₃ and R₃–R₄; cilia pale yellow. Hindwing and cilia gray. Abdomen: Male genitalia (Figure 1d). Uncus absent. Socius broad triangular and hairy. Valva broad at base, slightly concave ventrally and produced into a broad neck; sacculus angle with a slender hairy lobe directed dorsad; cucullus broad oval, hairy, with a stout spine ventrally. Phallus slender tubular, curving ventrad, narrowed to the end from half, with a tapering end; cornuti undetected.

Holotype ♂, CHINA: Motuo County 80 K (29.66° N, 95.49° E), Tibet Autonomous Region, alt. 2059 m, 9 August 2017, leg. Qi M.J. & Yang X.F., genitalia slide no. ZAH19014. Female unknown.

- Distribution. China (Tibet).
- Etymology. The specific name is derived from the Latin *spinatus* (=spinous), referring to the cucullus with a stout spine ventrally.

3.3.3. *Rhopalovalva catharotorna* (Meyrick, 1935)

Acroclita catharotorna Meyrick, 1935, in: Caradja & Meyrick, Materialien zu einer Microlepidopteren Fauna der chinesischen Provinzen Kiangsu, Chekiang und Hunan: 53 [19]; Clarke, 1958, Catalogue of the type specimens of Microlepidoptera in the British Museum (Nat. Hist.) described by Edward Meyrick, 3: 268 [20]; Razowski, 1999, SHILAP Revista de lepidopterologia, 27 (108): 447 [11]; Nasu, 2013, in: Nasu, Hirowatari & Kishida (eds.), The Standard of Moths in Japan, 4: 233 [6]. TL: China, Mt. Tianmu; TD: NHMUK.

Rhopalovalva catharotorna: Diakonoff, 1973, Zoölogische Monographieën van het Rijksmuseum van Natuurlijke Historie (Leiden), 1: 692 [21]; Kawabe, 1982, in: Inoue et al. (eds.), Moths of Japan, 1: 119, 2: 173 [5]; Kuznetsov, 2001, in: Ler (ed.), Key to the insects of Russian Far East, 5(3): 423 [8].

- Specimens examined. 1♂, Tianjin, Jixian, Mt. Baxian, 550 m, 23 June 2001, leg. Li H.H.; 1♀, Tianjin, Jixian, Mt. Baxian, alt. 510 m, 16 August 1997, leg. Li H.H.; 1♂, Hunan Province, Shimen County, Hupingshan, Nanping, alt. 504 m, 4 April 2002, leg. Yu Haili; 1♀, Shaanxi Province, Yangxian, Mazhuan, alt. 600 m, 18 May 1995, leg. Wang H.J.; 1♂, Shanxi Province, Yuncheng, Taikuanhe Natural Reserve, Sijiao Forest Station, alt. 893 m, 6 August 2013, leg. Hao S.L. & Peng Y.F.; 1♂, 1♀, Guizhou Province, Suiyang County, Kuankuoshui Natural Reserve, Xiasi village, alt. 840 m, 6 June 2010, leg. Yang L.L.; 1♂, Zhejiang Province, Taishun, Wuyanling, alt. 790 m, 2 August 2007, leg. Jin Q.; 1♀, Beijing, Wulingshan, Longtan, 14 August 2007, leg. Yu X.F. & Zhang T. (deposited in Beijing University of Agriculture).
- Distribution. China (Beijing, Tianjin, Shanxi, Shaanxi, Shanghai, Zhejiang, Hunan, Guizhou, Taiwan) and Japan (Honshu, Tsushima).
- Remarks. This species can be easily distinguished by a socius longer than the uncus, a deeply concave valva ventrally, sacculus angled with a slender hairy lobe and a cucullus with a spinous process ventrally.

3.3.4. *Rhopalovalva connata* Zhang, Bai & Li, 2017

Rhopalovalva connata Zhang, Bai & Li, 2017, Zootaxa, 4231(1): 116 [15]. TL: China, Yunnan Province, Xishuangbanna, Wild Elephants Valley; TD: NKUM.

- Specimens examined. 1♂, Yunan Province, Xishuangbanna, Wild Elephants Valley (22.17° N, 100.87° E), alt. 762 m, 19 July 2014, leg. Teng K.J., Guan W., Wang X.C. & Liu S.R., genitalia slide no. ZAH15026.
- Distribution. China (Yunnan).
- Remarks. This species can be separated easily from its congeners by the following characteristics: uncus absent, socii fused and produced into a rectangular sclerite, with few hairs on termination laterally.

3.3.5. *Rhopalovalva exartemana* (Kennel, 1901)

Acroclita exartemana Kennel, 1901, Deutsche entomologische Zeitschrift Iris, 13: 260 [22]; Kennel, 1916, Zoologica, 21: 467 [23]. TL: Russia, Primorsky Krai, Ussuri, Askold Island; TD: MNHU.

Rhopalovalva exartemana: Kuznetsov, 1964, Entomologicheskoe Obozrenie, 43 (4): 885 [4]; Razowski, 1971, Acta zoologica cracoviensia, 15 (10): 519 [24]; Kawabe, 1982, in: Inoue et al. (eds.), Moths of Japan, 1: 119, 2: 173 [5]; Byun et al., 1998, Illustrated catalogue of Tortricidae in Korea (Lepidoptera), 172 [7]; Razowski, 1999, SHILAP Revista de lepidopterologia, 27 (108): 445 [11]; Kuznetsov, 2001, in: Ler (ed.), Key to the insects of Russian Far East, 5 (3): 423 [8]; Nasu, 2013, in: Nasu, Hirowatari & Kishida (eds.), The Standard of Moths in Japan, 4: 232 [6].

- Distribution. China (Heilongjiang), Korea, Japan (Hokkaido, Honshu, Kyushu, Shikoku), Russia (Amur: Priamur'e, S. Primor'e, S. Kuril Is.).
- Remarks. In this study, the specimens are unavailable. This species can be separated from other species by its clubbed uncus, narrowed to the end, a cucullus with a process not dilated apically and sacculus angled with a hairy mound.

3.3.6. *Rhopalovalva grapholitana* (Caradja, 1916)

Acroclita grapholitana Caradja, 1916, Deutsche entomologische Zeitschrift Iris, 30: 60 [25]. TL: Russia Khabarovsk Krai, Raddé; TD: MGAB.

Acroclita cordelia Meyrick, 1935, in: Caradja & Meyrick, Materialien zu einer Microlepidopteren Fauna der chinesischen Provinzen Kiangsu, Chekiang und Hunan: 52 [19]; Clarke, 1958, Catalogue of the type specimens of Microlepidoptera in the British Museum (Nat. Hist.) described by Edward Meyrick, 3: 271 [20].

Rhopalovalva grapholitana: Kuznetsov, 1964, Trudy Zoologicheskogo Instituta, Leningrad, 43(4): 886 [4]; Razowski, 1989, Acta zoologica cracoviensia, 32 (7): 256 [26]; Razowski, 1999, SHILAP Revista de lepidopterologia, 27 (108): 445 [11]; Byun et al., 1998, Illustrated catalogue of Tortricidae in Korea (Lepidoptera), 172 [7]; Kuznetsov, 2001, in: Ler (ed.), Key to the insects of Russian Far East, 5 (3): 423 [7]; Liu & Li, 2002, Fauna Sinica, Insecta, Vol. 27, Tortricidae, 318 [12].

- Specimens examined. 12♂, Gansu Province, Wen County, Yanggashan, alt. 2000 m, 5 July 2001, leg. Li H.H. & Wang X.P.; 1♂, Shaanxi Province, Ziyang County, Shangdong township, alt. 350 m, 21 May 1994, leg. Zhou J.; 2♂, Henan Province, Gushi County, Zushi Town, Liulou village, alt. 120 m, 16 April 1995, leg. Yan G.Y.; 1♂, Ningxia Hui Autonomous Region, Zhongwei County, Shapotou, 1985~1987, leg. Sun H.Y.; 1♂, Hebei Province, Laiyuan, Baishishan, alt. 1300 m, 21 July 2000, leg. Yu H.L. et al.; 2♀, Henan Province, Huixian, Baligou, alt. 780 m, 12 July 2002, leg. Wang X.P.
- Distribution. China (Beijing, Hebei, Northeast part, Shanghai, Anhui, Jiangxi, Henan, Shaanxi, Gansu, Ningxia), Korea, Russia (Amur: Khabarovsk Krai, Zeya, Priamur'e, S. Primor'e).
- Host plants. Leguminosae: *Lespedeza bicolor* Turcz. [8]; Convolvulaceae: *Ipomoea aquatica* Forsk. [9].

- Remarks. This species is characterized by a cucullus with a process dilated apically and a sacculus angle with a slightly broad lobe with the termination gradually narrowed.

3.3.7. *Rhopalovalva lascivana* (Christoph, 1882)

Eudemis lascivana Christoph, 1882, Bulletin de la Société impériale des naturalistes de Moscou, 56: 405 [27]; Kennel, 1916, Zoologica, 21: 467 [23]. TL: Russia, Primorsky Krai, Vladivostok; TD: Unknown.

Rhopalovalva lascivana: Kuznetsov, 1964, Trudy Zoologicheskogo Instituta, Leningrad, 43 (4): 885 [4]; Kawabe, 1982, in: Inoue et al. (eds), Moths of Japan, 1: 118, 2: 173 [5]; Byun et al., 1998, Illustrated Catalogue of Tortricidae in Korea (Lepidoptera), 173 [7]; Razowski, 1999, SHILAP Revista de lepidopterologia, 27 (108): 445 [11]; Kuznetsov, 2001, in: Ler (ed.), Key to the insects of Russian Far East, 5 (3): 423 [8].

- Specimens examined. 1♀, Guizhou Province, Libo County, Maolan National Natural Reserve, Dongtang, 23 May 1998, leg. Liao Q.R.
- Host plant. Fagaceae: *Quercus mongolica* Fisch. ex Ledeb. [6].
- Distribution. China (Guizhou), Korea, Japan (Honshu, Shikoku, Kyusyu), Russia (Amur: Priamur'e, S. Primor'e, S. Kuril Is.).
- Remarks. This species is characterized by an uncus with pointed termination, a socius obviously longer than the uncus, a sacculus with a broad and short lobe and a cucullus with a slender, club-shaped process.

3.3.8. *Rhopalovalva macrocuculla* Zhang, Bai & Li, 2017

Rhopalovalva macrocuculla Zhang, Bai & Li, 2017, Zootaxa, 4231 (1): 115 [15]. TL: China, Zhejiang Province, Longxushan, Pinggang; TD: NKUM.

- Specimens examined. 2♂, Zhejiang Province, Longxushan, Pinggang, alt. 754 m, 25 August 2014, leg. Yin A.H., Wang Q.Y. & Li S.R.; 3♂, Zhejiang Province, Longtangshan, Jiufu village, alt. 520 m, 27–30 August 2014, leg. Yin A.H., Wang Q.Y. & Li S.R.; 1♂, Zhejiang Province, Longxushan, Longxushan village, alt. 778 m, 17 August 2014, leg. Yin A.H., Wang Q.Y. & Li S.R.; 1♂, Zhejiang Province, Mt. Tianmu, Lao'an, alt. 555 m, 17 August 2014, leg. Yin A.H., Wang Q.Y. & Li S.R.; 2♂, Zhejiang Province, Lishui, Longquan, Mt. Fengyang, alt. 1470 m, 25 July 2007, leg. Jin Q., genitalia slide no. ZX08004; 1♂, Hainan Province, Diaoluoshan, alt. 940 m, 2 June 2007, leg. Zhang Z.W. & Li W.C., genitalia slide no. BX15388; 1♂, Hainan Province, Wuzhishan, alt. 700 m, 19 May 2007, leg. Zhang Z.W. & Li W.C.; 2♂, 2♀, Hainan Province, Jianfengling Natural Reserve, alt. 940 m, 4–7 June 2007, leg. Zhang Z.W. & Li W.C.; 1♂, Hainan Province, Tianchi, Jianfengling Natural Reserve, 11 June 2010, leg. Hu B.B. & Zhang J.; 1♂, Hainan Province, Tianchi, Jianfengling Natural Reserve, alt. 1050 m, 30 April 2013, leg. Sun Y.H., Guan W. & Liu T.T.; 2♂, Hainan Province, Tianchi, Jianfengling Natural Reserve, alt. 787 m, 12 & 16 July 2015, leg. Wang Q.Y., Li S.R. & Chen M.T., genitalia slide no. BX15086; 2♂, Hainan Province, Jianfengling Natural Reserve, alt. 770 m, 30 May & 3 June 2015, leg. Cong P.X., Guan W. & Hu S.; 4♂, 3♀, Hainan Province, Jianfengling Natural Reserve, alt. 770 m, 13–17 July 2014, Cong P.X., Liu L.J. & Hu S., genitalia slide no. BX15087; 1♀, Hainan Province, Tianchi, Jianfengling Natural Reserve, alt. 787 m, 15 January 2016, leg. Teng K.J., Bai X. & Chen M.T.; 1♂, Hainan Province, Wuzhishan Natural Reserve, alt. 742 m, 21 May 2015, leg. Cong P.X., Guan W. & Hu S., genitalia slide no. BX15085; 2♂, 1 ♀, Hainan Province, Wuzhishan Natural Reserve, alt. 766 m, 8–11 January 2016, leg. Teng K.J., Bai X. & Chen M.T., genitalia slide nos. BX15389, BX15390.
- Distribution. China (Zhejiang, Hainan).
- Remarks. This species can be distinguished by a cucullus distinctly larger than the base of the valva, nearly orthogonal dorsally, socius broad and long, about 2.5 times as long as the uncus in the male genitalia, and a funnel-shaped antrum, occupying about half of the ductus bursae in the female genitalia.

3.3.9. *Rhopalovalva orbiculata* Zhang & Li, 2004

Rhopalovalva orbiculata Zhang & Li, 2004, *Nota lepidopterologica*, 27 (2/3): 241 [13]. TL: China: Guangxi Autonomous Region: Mt. Mao'er; TD: NKUM.

- Specimens examined. 2♂, Guangxi Zhuang Autonomous Region, Mt. Mao'er, alt. 1100 m, 20 April 2002, leg. Hao S.L. & Xue H.J., genitalia slide no. ZAH03720; 1♀, Guizhou Province, Mt. Fanjing, alt. 1300 m, 2 August 2001, leg. Li H.H. & Wang X.P.; 1♂, 1♀, Guizhou Province, Xishui County, alt. 1200 m, 1 June 2000, leg. Du Y. L.; 1♂, Henan Province, Songxian, Mt. Baiyun, alt. 1580 m, 20 July 2002, leg. Wang X.P.; 1♂, Guizhou Province, Daozhen County, Dashahe, alt. 1450 m, 23 May 2004, leg. Hao S.L.; 3♂, 1♀, Guizhou Province, Daozhen County, Dashahe, 24 August 2004, leg. Xiao Y.L.; 7♂, 1♀, Guizhou Province, Daozhen County, Guocun, alt. 1300 m, 20 August 2004, leg. Xiao Y.L.; 1♂, Fujian Province, Yongtai, Mt. Qingyun, alt. 550 m, 18 September 2002, leg. Wang X.P.; 1♂, Hunan Province, Shimen County, Mt. Hupin, Nanping, alt. 504 m, 4 May 2002, leg. Yu H.L.; 1♂, Guizhou Province, Mt. Fanjing, Huguosi, alt. 1300 m, 2 August 2001, leg. Li H.H. & Wang X.P.; 1♀, Guizhou Province, Jiangkou County, Heiwan, alt. 600 m, 3 August 2001, leg. Li H.H. & Wang X.P.
- Distribution. China (Fujian, Henan, Hunan, Guangxi, Guizhou).
- Remarks. This species is similar to *R. lascivana* (Christoph, 1882) in external appearance, but differs from the latter in uncus slightly broadened apically and socius as long as uncus, whereas in the latter species uncus is pointed apically and socius is much longer than uncus.

3.3.10. *Rhopalovalva ovata* Zhang & Li, 2004

Rhopalovalva ovata Zhang & Li, 2004, *Nota lepidopterologica*, 27 (2/3): 240 [13]. TL: China, Hunan Province, Sangzhi County; TD: NKUM.

- Specimens examined. 1♂, Hunan Province, Sangzhi County, alt. 1250 m, 13 August 2001, leg. Li H.H. & Wang X.P., genitalia slide no. ZAH03773; 2♂, Henan Province, Songxian, Mt. Baiyun, alt. 1580 m, 18 July 2002, leg. Wang X.P.
- Distribution. China (Henan, Hunan).
- Remarks. This species is different from any other species of the genus in socius nearly ovate and cucullus with a short clubbed process on a triangular projection ventrally; in the other species socius is broad triangular or narrow and long, and cucullus has a spine or slender process ventrally or no process.

3.3.11. *Rhopalovalva pulchra* (Butler, 1879)

Phoxopteryx pulchra Butler, 1879, *Illustrations of typical specimens of Lepidoptera Heterocera in the Collection of the British Museum*, 3: 79 [28]. TL: Japan, Honshu, Kanagawa Prefecture, Yokohama. TD: NHMUK.

Rhopalovalva pulchra: Kuznetzov, 1976, *Trudy Zoologicheskogo Instituta, Leningrad*, 64: 19 [29]; Kawabe, 1982, in: Inoue et al. (eds.), *Moths of Japan*, 1: 119, 2: 173 [5]; Byun et al., 1998, *Illustrated catalogue of Tortricidae in Korea (Lepidoptera)*, 173 [7]; Kuznetzov, 2001, in: Ler (ed.), *Key to the insects of Russian Far East*, 5 (3): 423 [8]; Nasu, 2013, in: Nasu, Hirowatari & Kishida (eds.), *The Standard of Moths in Japan*, 4: 232 [6].

- Specimens examined. 1♂, Zhejiang Province, Mt. Tianmu, alt. 350 m, 15 August 1999, leg. Li H.H. et al.; 1♂, Fujian Province, Mt. Wuyi, San'gang, alt. 740 m, 24 May 2004, leg. Yu H.L.; 1♂, Mt. Wuyi, Xianfengling, alt. 1000 m, 26 May 2004, leg. Yu H.L.; 1♂, Henan Province, Tongbai County, Shuiliandong, alt. 300 m, 11 September 2001, leg. Li H.H. & Karsholt O.; 1♀, Henan Province, Xixia County, Huangshi'an, alt. 890 m, 19 July 1998, leg. Li H.H.
- Host plants. Fagaceae: *Quercus* sp. [5].
- Distribution. China (Zhejiang, Henan, Fujian), Korea, Japan (Hokkaido, Honshu, Shikoku, Kyushu, Tsushima), Russia (S. Primor'e).

- Remarks. This species can be easily separated from other species by its valva with neck distinct, a sacculus with a very short lobe or a hairy mound and a cucullus with a spine ventrally in the male genitalia.

Byun et al. recorded the host plant of *R. pulchra* included *Fraxinus mandshurica* var. *japonica* Maxim. (Oleaceae) [6]. By checking the original reference [30], we found *F. mandshurica* var. *japonica* Maxim. was recorded as the food plant of *Rhopobota naevana* (Hübner, [1817]) [31]. So *F. mandshurica* var. *japonica* Maxim. is excluded in the host plants information of *R. pulchra*.

3.3.12. *Rhopalovalva rhombea* Zhang & Li, 2010

Rhopalovalva rhombea Zhang & Li, 2010, Zootaxa, 2718: 65 [14]. TL: China, Fujian Province, Mt. Wuyi; TD: NKUM.

- Specimens examined. 1♂, Fujian Province, Mt. Wuyi, Guadun, alt. 1100 m, 23 May 2004, leg. Yu H.L., genitalia slide no. YHL04382; 1♀, Fujian Province, Mt. Wuyi, San'gang, alt. 740 m, 19 May 2004, leg. Yu H.L.; 1♂, Guangxi Zhuang Autonomous Region, Jinxiu County, alt. 550 m, 15 April 2002, leg. Hao S.L. & Xue H.J.; 1♂, Fujian Province, Yongtai, Mt. Qingyun, alt. 550 m, 18 September 2002, leg. Wang X.P.
- Distribution. China (Fujian, Guangxi).
- Remarks. This species is superficially similar to *R. grapholitana* (Caradja, 1916) but can be distinguished by a rhomboid cucullus without a ventral process and a socius broadening distally in the male genitalia; the corpus bursae is elliptic and the signa is long-horned in the female genitalia. While in *R. grapholitana* the cucullus is elliptic with a ventral process, the socius is slightly narrowed distally, the corpus bursae is round and the signa are conical.

3.3.13. *Rhopalovalva triangulata* Zhang & Li, 2010

Rhopalovalva triangulata Zhang & Li, 2010, Zootaxa, 2718: 67 [14]. TL: China, Shaanxi Province, Yangling; TD: NKUM.

- Specimens examined. 1♂, Shaanxi Province, Yangling, 18 June 1985, leg. Li H.H., genitalia slide no. ZAH04094; 1♂, Shaanxi Province, Fengxian, Xinjiashan forestry station, alt. 1600 m, 13 July 1988, leg. Li H.H.
- Distribution. China (Shaanxi).
- Remarks. This species can be separated easily from its congeners by the nearly Y-shaped uncus, which is club-shaped or absent in other species. *R. triangulata* shares with *R. rhombea* the absence of a process or spine on the cucullus ventrally, but the two can be distinguished by the shape of the cucullus: triangular in *R. triangulata* and rhomboid in *R. rhombea*.

3.4. Distribution of the Species of *Rhopalovalva*

In China, the species of *Rhopalovalva* are distributed in Heilongjiang province to north, Hainan province to south (Figure 2) and more species are distributed in the Oriental region. The distributions of *R. catharotorna* (Meyrick, 1935) and *R. grapholitana* (Caradja, 1916) are much wider than other species.



Figure 2. Distribution of the species of *Rhopalovalva* from China. 1. *R. stilliformis* sp. nov.; 2. *R. spinata* sp. nov.; 3. *R. cathartotorna* (Meyrick, 1935); 4. *R. connata* Zhang, Bai & Li, 2017; 5. *R. exartemana* (Kennel, 1901); 6. *R. grapholitana* (Caradja, 1916); 7. *R. lacivana* (Christoph, 1882); 8. *R. macrocuculla* Zhang, Bai & Li, 2017; 9. *R. orbiculata* Zhang & Li, 2004; 10. *R. ovata* Zhang & Li, 2004; 11. *R. pulchra* (Butler, 1879); 12. *R. rhombea* Zhang & Li, 2010; 13. *R. triangulata* Zhang & Li, 2010.

4. Discussion

Razowski proposed two characters, a hairy lobe situated at the distal end of the sacculus and the presence of a pollex on the cucullus, to be regarded as autapomorphies of the genus *Rhopalovalva* [26]. Based on examination of Chinese species of *Rhopalovalva* and comparison with the characteristics provided by Razowski, it can be confirmed once again that the dorsally directed hairy lobe at the distal end of the sacculus is considered as an autapomorphy. At the same time, in some species, the hair lobe is degenerative, e.g., *R. pulchra* (Butler) with a very short hairy lobe nearly produced into a hairy mound and *R. exartemana* (Kennel) and *R. chidorinoki* Nasu with a hairy mound instead of a hairy lobe. The character of a pollex on the cucullus is absent in some Chinese species of *Rhopalovalva*, e.g., *R. connata* Zhang, Bai & Li; *R. macrocuculla* Zhang, Bai & Li; *R. rhombea* Zhang & Li; and *R. triangulata* Zhang & Li et al.

Amendment of *Rhopalovalva* Diagnosis

On the basis of species of *Rhopalovalva* described, the genus definition is revised as follows: The uncus is slender, clubbed or Y-shaped, occasionally absent (in *R. connata* and *R. spinata* sp. nov.); the socii are paired, occasionally healed (in *R. connata*); the distal end of the sacculus with a hairy lobe is directed dorsally, occasionally a hairy mound instead of a hairy lobe (in *R. exartemana* and *R. chidorinoki*); the cucullus is varied, often with a ventral process or spine (i.e., “pollex” as called by Razowski) in the male genitalia; and two funnel-like or hornlike signa are present in the corpus bursae in the female genitalia.

5. Conclusions

Based on the present study, the genus *Rhopalovalva* Kuznetsov is composed of 16 species, including 2 new species described herein. Of those, 13 are distributed in China, occupying 81.25%, showing the higher richness on species. The genitalia characteristics as follows are

important for recognition on species of *Rhopalovalva*: the distal end of sacculus with a hairy lobe directed dorsally, occasionally a hairy mound instead of a lobe (in *R. exartemana* and *R. chidorinoki* Nasu) and the cucullus often with a ventral process or spine (i.e., “pollex” as called by Razowski) in the male genitalia.

Author Contributions: X.B. collected some of the specimens and wrote the original draft manuscript; A.Z. and X.B. prepared the genitalia slides; A.Z. took photographs for specimens and reviewed and revised the manuscript before submission. All authors have read and agreed to the submitted version of the manuscript.

Funding: This research was supported by the National Natural Science Foundation of China, grant number 31101665.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Some data presented in this study are openly available in [1].

Acknowledgments: We are grateful to the assistance of R.L. Brown (Mississippi Entomological Museum, Department of Entomology, Mississippi State University, USA), Y. Nasu (Osaka Prefectural Agricultural, Forestry Research Center, Osaka, Japan) and B.K. Byun (Department of Biological Science & Biotechnology, Hannam University, Daejeon, Republic of Korea) with references. We are also grateful to H.H. Li (Nankai University, Tianjin, China) for providing the specimens used, M.J. Qi (Nankai University, Tianjin, China) for help with taking photos of the specimens and everyone for collecting specimens in this study. We also express our sincere thanks to the anonymous reviewers for their comments and suggestions. This research was supported by the National Natural Science Foundation of China (31101665).

Conflicts of Interest: The authors declare no conflict of interest.

Abbreviations

TL	Type Locality
TD	Type Depository
NHMUK	The Natural History Museum, London, United Kingdom
MGAB	Muzeul de Istoria Naturala Grigore Antipa, Bucharest, Romania
MNHU	Museum für Naturkunde der Humboldt Universität, Berlin, Germany
NKUM	Insects Collections, Nankai University, Tianjin, China

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