Zootaxa 1465: 55–64 (2007)
www.mapress.com/zootaxa/

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

A review of the *Torodora manoconta* species-group (Lepidoptera: Lecithoceridae), with descriptions of three new species

KYU-TEK PARK
Center for Insect Systematics, Kangwon National University, Chuncheon, 200-701 Korea. E-mail: cispa@kangwon.ac.kr

Abstract

The *monoconta* species-group of the genus *Torodora* Meyrick is proposed, and its species are reviewed. Three new species are described: *T. vietnamensis* **sp. nov.**, *T. babeana* **sp. nov.**, and *T. rectivalvata* **sp. nov.** A key to the species of the group is provided, along with photographs of the adults and their genitalia.

Key words: Taxonomy, new species, *manoconta* group, *Torodora*, Lecithoceridae, Lepidoptera

Introduction

Torodora Meyrick is an Oriental genus belonging to the subfamily Torodorinae, comprising more than 100 species (Gozmány, 1978; Wu, 1997; Park, 2002). The genus is characterized by features of wing venation and genitalia, but many species are nearly indistinguishable without comparing their genital morphology. Subsequent to the description of *Torodora manoconta* Wu & Liu, 1994 from China, three related species were described: *T. epitriona* Park and *T. spinula* Park from Thailand in 2002 and *T. chinanensis* Park from Taiwan in 2003. In this paper, I propose that these species, along with three new species, represent a distinct monophyletic group, the *Torodora manoconta* species-group, separated from other species of the genus by external and male genitalia characters. The group is characterized by a yellowish-white head; a narrow forewing with a shinning pale grayish-orange to brownish-orange ground color (or sometimes light brown), often with a yellowish triangular or elongate patch on inner margin mesially; the hind tibia with blackish scales near the apex outwardly; and the male genitalia with the uncus clavate or with a broadly expanded, mushroomlike apex, the valva foot-shaped, the juxta well sclerotized with slender latero-caudal lobes, and the aedeagus usually with a pair of slender cornuti.

Based on Lepidoptera collected during recent expeditions (2003–2006) to North Vietnam, two new species belonging to this group were discovered. In this paper I describe these, present a key to the group based on superficial and male genitalia characters, and provide taxonomic remarks on the species.

Abbreviations for specimens depositories: USNM—United States National Museum of Natural History, Smithsonian Institution, Washington, U.S.A.; ZMUC—Zoological Museum, Copenhagen, Denmark; OPU—Osaka Prefecture University, Osaka, Japan; CIS—Center for Insect Systematics, Kangwon National University, Chuncheon, Korea.

Key to the species of the *Torodora manoconta* species-group, based on external and male genitalia characters

1. Forewing length >25 mm; forewing brownish with large triangular yellowish patch on inner margin mesially ..... *T. chinanensis*
- Forewing length <22 mm; forewing pale brownish orange with small or poorly developed yellowish patch

Accepted by J. Brown: 27 Mar. 2007; published: 3 May 2007

on inner margin mesially 2

2. Forewing length <15 mm; valva with a short spine on outer margin; uncus funnel-shaped.....*T. spinula*
- Forewing length >16 mm; valva without spine on outer margin; uncus clavate or broadly expanded at apex..... 3
3. Hindwing with M_3 and CuA_1 stalked beyond 2/3; lateral lobe of juxta triangular, weakly sclerotized 4
- Hindwing with M_3 and CuA_1 stalked before middle; lateral lobe of juxta slender or horn-shaped with pointed apex, or serrate in preapical margin..... 5
4. Valva with costa expanded subbasally, distal part usually foot-shaped; juxta with small crescent-shaped median flap .....*T. manoconta*
- Valva with costa nearly straight at basal half, distal part nearly triangular; juxta with heavily sclerotized, large triangular median flap..... *T. rectivalvata*
5. Aedeagus with a pair of long, slender, bar-shaped cornuti, the longer one thin (often deciduous when dissected), the shorter one stout, about 1/2 length of longer one ..... *T. vietnamensis*
- Aedeagus with a pair of short cornuti, the longer one about 1/3 length of aedeagus, other one with a sclerotized rounded basal plate 6
6. Uncus clavate, with small, round apex; lateral lobe of juxta slender, horn-shaped, gently bent outwardly with pointed apex; 8th sternum broadly convex mesially.....*T. epitriona*
- Uncus with broadly expanded apex; lateral lobe of juxta digitate, with serrate preapical outer margin; 8th sternum slightly convex mesially .....*T. babeana*

Species accounts

***Torodora manoconta* Wu & Liu, 1994**
(Figs. 1, 8, 8a, 15)

Torodora manoconta Wu & Liu, 1994. Sinozoologica 11: 164, fig. 9; Wu, 1997: 67.

Diagnosis. Forewing length 19–22 mm. This species is characterized by a yellowish white head and a narrow, elongate, shiny pale grayish orange to golden brown forewing, often with a yellowish triangular or elongate patch on the inner margin mesially. This species is superficially very similar to *T. epitriona*, but the two can be distinguished by male genitalia structures used in the key.

Male genitalia (Figs. 8, 8a). Uncus broadly expanded caudally. Gnathos slender, bent beyond 3/4 length. Valva with costa broadly expanded subbasally, then concave. Lateral lobe of juxta broad at base, triangularly protruded with acute apex; median flap rather small. Aedeagus stout, with a pair of bar-shaped cornuti: longer one slender, as long as aedeagus, shorter one less than 1/2 length of longer one (longer one often dislodged by dissecting genitalia).

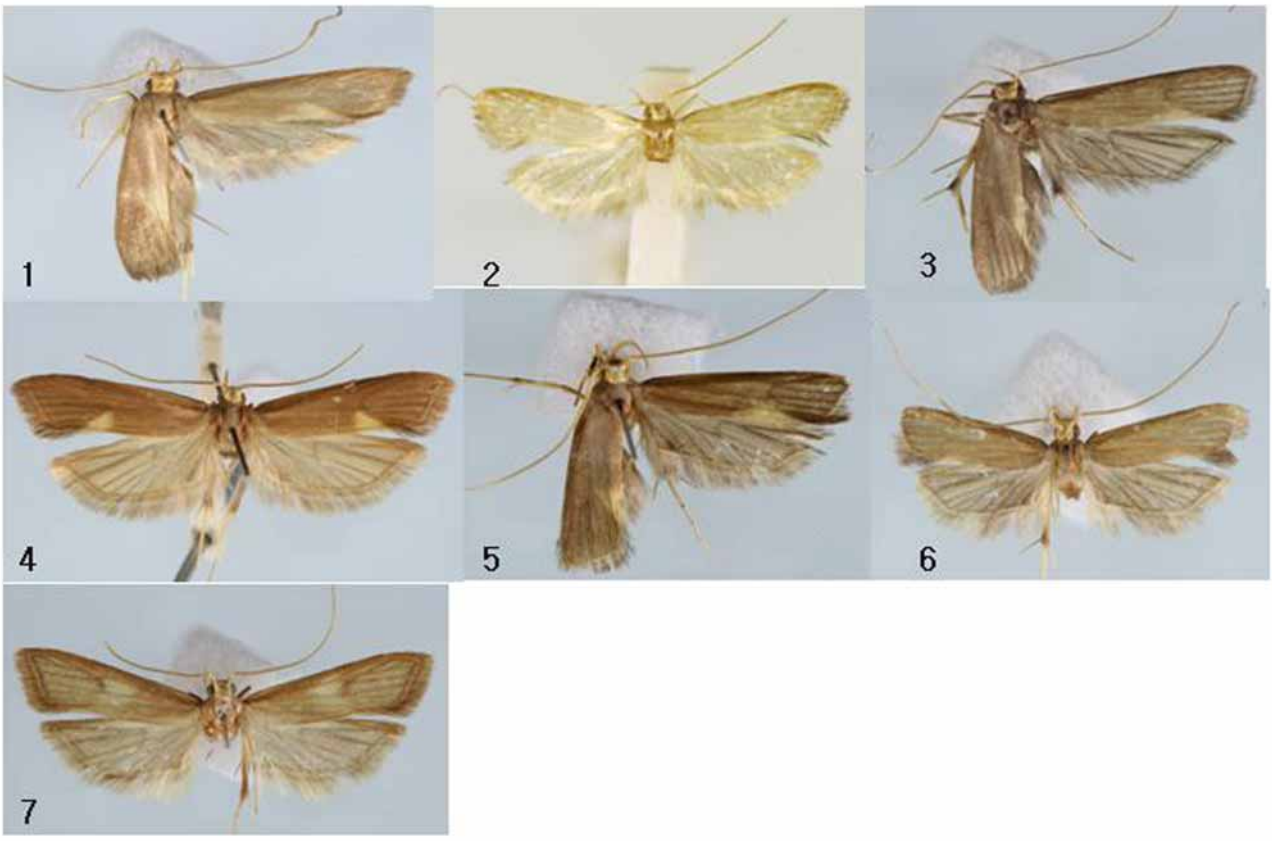
Female genitalia (Fig. 15). Eighth sternum emarginate mesially. Ductus bursae broad with a long, band-like, sclerotized plate longitidunally and several short spines. Corpus bursae with a long, strawberry-shaped signum, about 1/2 length of corpus bursae.

Material examined. Taiwan: 1♂, Shanpin For. Stn., 750 m, Liukuei, 10 km SE Kaohsiung Co., 5–6.VII.1986 (K.T. Park & H.K. Lee), genitalia slide no. CIS-4183. 3♂, Wulai, 550 m, Taipei Co., 1–2.VII.1996 (K.T. Park & J.S. Lee), gen. slide no. CIS-4183. 1♂, Liukuei, Shanpin For. Stn., 750m, Kaohsiung Co., 16–23.III.1986 (J.B. Heppner & H. Wang). 1♀, Chiangasan, 1100 m, Taichung Co., 8–11.V.1989 (J.B. Heppner & H. Wang), gen. slide. no. CIS-4109.

Distribution. China (Jiangxi, Yunan), Taiwan (Kaohsiung, Taichung, Taipei).

Remarks. In the Taiwanese specimen illustrated by Park (2000), the shapes of the cornuti in the male gen-

italia are slightly different; Park (2000) noted that further study of the variation in the cornuti is needed.



FIGURES 1–7. Adults. *1, Torodora manoconta* Wu & Liu; 2, *T. epitriona* Park (holotype); 3, *T. vietnamensis* **sp. nov.** (paratype); 4, *T. chinanensis* Park (holotype); 5, *T. babeana* **sp. nov.** (paratype); 6, *T. spinula* Park(holotype); 7, *T. rectivalvata* **sp. nov.** (holotype)

***Torodora epitriona* Park, 2002**
(Figs. 2, 9, 9a)

Torodora epitriona Park, 2002. Ins. Koreana 19: 152, figs. 5, 23, 23a. TL: Chiang Mai, Thailand [ZMUC].

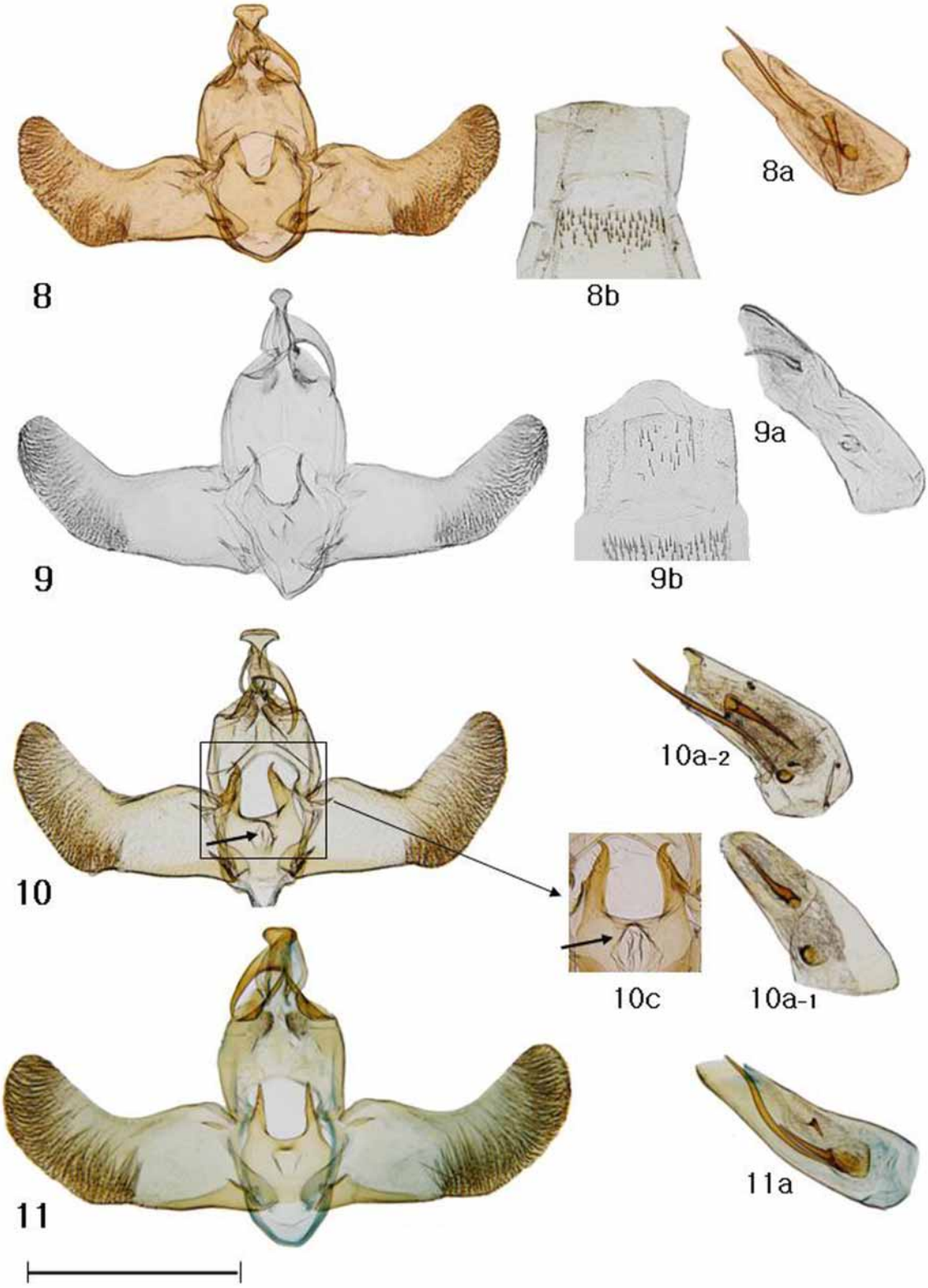
Diagnosis. Forewing length 16.0 mm. This species is among the smaller species of the *manoconta*-group. It can be distinguished from its allies by features of the male genitalia used in the key.

Male genitalia (Figs. 9, 9a; also see Park, 2002: figs. 23, 23a). Separated from its allies by a clavate uncus with smaller apex; lateral lobe of juxta slender, curved outwardly, with sharply pointed apex; cornutus shorter, about 1/3 length of aedeagus; 8th sternum longer, broadly convex on caudal margin mesially.

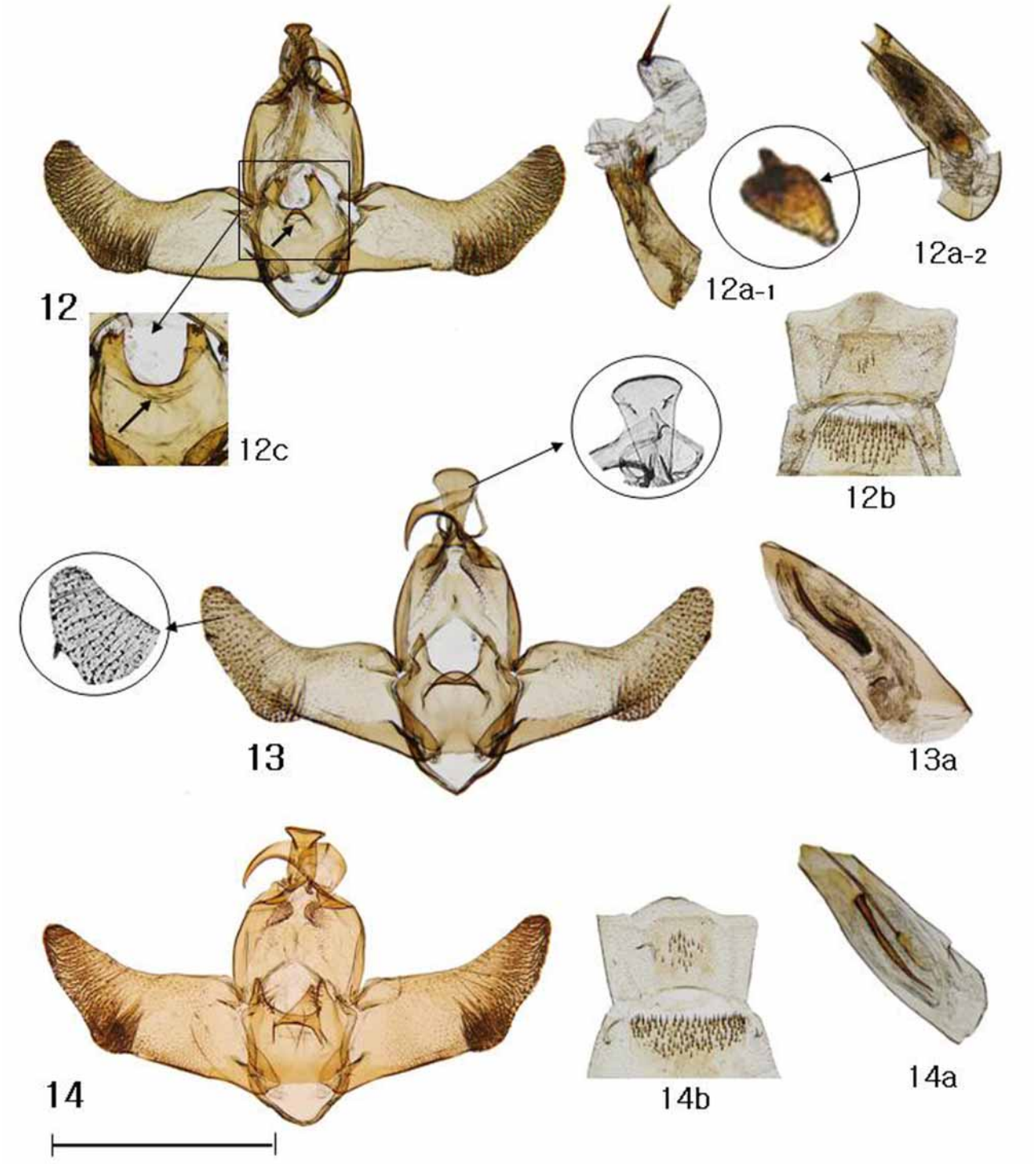
Material examined. Thailand*:* 1♂, Chiang Mai, Doi Suthep-pui, 1650 m, 17–28.X.1984 (holotype), gen. prep. no. CIS-4839.

Distribution. Thailand (Chiang Mai).

Remarks. The species was described from a single male from Thailand; no additional specimens have been found.



FIGURES 8–11. Male genitalia (a: aedeagus, b: 7th– 8th segments): 8, *Torodora manoconta* Wu & Liu, gen. slide no. CIS-4183; 9, *T. epitriona* Park, gen. slide no. CIS-4839; 10, *T. vietnamensis* **sp. nov.**, gen. slide no. CIS-4953, holotype; 10a–b, *T. vietnamensis*, paratype; 10c, *T. vietnamensis*, juxta with lateral lobes of paratype; 11, *T. chinanensis* Park, gen. slide no. USNM-92451.



FIGURES 12–14. 12, *T. babeana* **sp. nov.**, gen. slide no. CIS-5242; 12a–b, *T. babeana*, aedeagus of paratype; 12c, *T. babeana*, juxta with lateral lobes of paratype; 13, *T. spinula* Park, gen. slide no. CIS-5246; 14, *T. rectivalvata* **sp. nov.**, gen. slide no. CIS-4960. Scale bars: 1 mm.

***Torodora vietnamensis* Park, sp. nov.**
(Figs. 3, 10, 10a–b)

Type. HOLOTYPE ♂, Tam Dao Nat. Park, 950 m, Vinh Phu Prov., Vietnam, 5.VII.2003 (K.T. Park), gen. slide. no. CIS-4953. PARATYPES. 1♂, same data as holotype, gen. slide no. CIS- 4962. 2 ♂, same locality,

26.IV.2006 (Park, Kim, & Kang). 6♂, Cuc Phuong Nat. Park, 200 m, Ninh Vinh Prov., Vietnam, 11–12.VI.2004 (K.T. Park & N. Cuong), gen. slide. no. CIS- 5210. 1♂, same locality, 30.VII.2006 (Park, Chae, & Cuong). Types deposited in CIS.

Diagnosis. In facies, *Torodora vietnamensis* is nearly indistinguishable from other species of the *manoconta* species-group, but it is easily distinguished by the heavily sclerotized, horn-shaped lateral lobe of the juxta. The entire structure of the male genitalia is similar to that of *T. manoconta* Wu & Liu, but it differs from the latter by the more widely expanded uncus caudally, the lateral lobe of the juxta narrowed apically and curved outwardly, and the 8th sternum more convex mesially.

Description. Male. Forewing length 19–20 mm. Head shiny, pale brownish orange, with concolorous erect scales laterally, Tegula and thorax shiny, brown. Antenna with pedicel pale brownish orange, shiny dorsally; flagellum pale brownish orange throughout, with pale brownish annulations. Second segment of labial palpus rather slender, pale brownish orange; 3rd segment as long as second, dark brown ventrally. Forewing ground color shiny, golden brown, often with a yellowish triangular or elongate patch before tornus on inner margin; apex somewhat rounded; termen less oblique; fringe golden brown at basal half, then paler beyond. R_3 stalked with R_{4+5} at basal 1/3; R_4 and R_5 stalked at basal 2/3 length; R_5 to termen; M_1 slightly close to R_{3+4+5} towards base; M_2 and M_3 connate at base; M_3 and CuA_1 stalked at basal 1/3, closely parallel. Hindwing pale yellowish brown; apex acute; M_3 and CuA_1 stalked at basal 1/3; fringe golden brown at basal half and paler beyond. Hind tibia with dark brown hairlike setae preapically.

Male genitalia (Figs. 10, 10a–b). Uncus broadly expanded at apex, almost triangular. Gnathos strongly bent downward. Valva foot-shaped; costa expanded anteriorly subbasally, deeply concave mesially. Lateral lobe of juxta horn-shaped, stout, with heavily sclerotized, acute apex; median flap sclerotized, convex ventrally; caudal margin U-shaped, deeply emarginated. Aedeagus with a pair of slender cornuti: longer one needle-shaped, as long as aedeagus, shorter one stouter, about 1/2 length of longer one. Female unknown.

Distribution. Vietnam (North).

Remarks. The longer cornutus of the aedeagus is sometimes deciduous when the genitalia are dissected, leaving only the round basal plate as shown in Fig. 10a. The round basal plate has a few spine-like fine processes along the margin.

Etymology. The specific name is derived from the country of the type locality.

Torodora chinanensis Park, 2003

(Figs. 4, 11, 11a)

Torodora chinanensis Park, 2003. J. Asia- Pacific Entom. 6: 16, fig. 2, 7, 7a. TL: Kaohsiung, Taiwan.

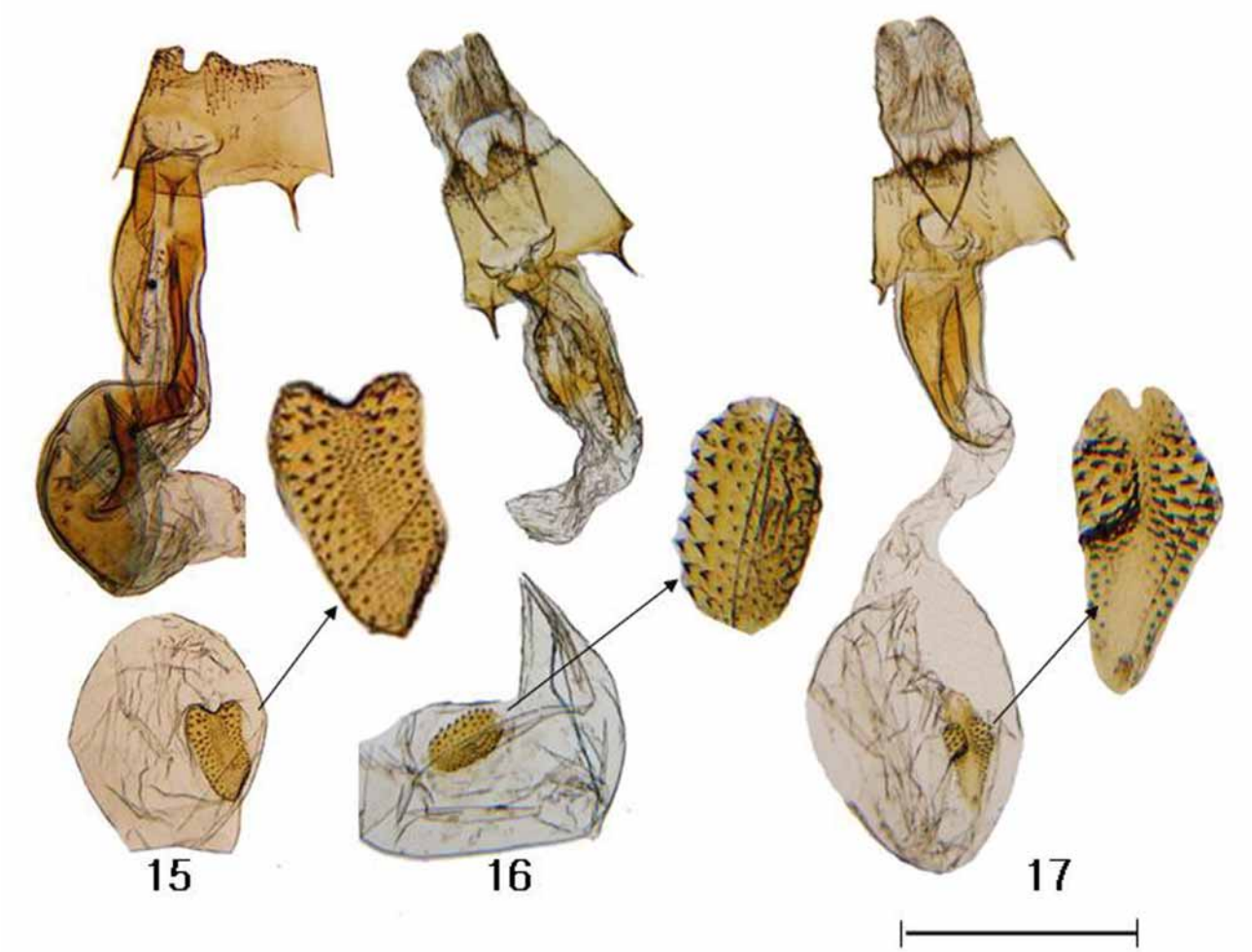
Diagnosis. Forewing length 25 mm. The species is the largest in the group with a large, yellowish triangular patch on inner margin of the forewing mesially. The male genitalia are distinguished from those of other species by the straight lateral lobes of the juxta and the cornuti.

Male genitalia (Figs. 11, 11a; also see also Park, 2003: figs. 7, 7a). Jjuxta and cornuti diagnostic: lateral lobe of juxta more heavily sclerotized, more slender, nearly straight, with pointed apex; cornuti consist of a pair of slender bars and a separate, short conical spine: the bars arise together, longer, about 3/4 length of aedeagus, S-shaped; shorter one about one half as long.

Material examined. Taiwan: 1♂, Chinanshan, Kaohsiung Co., 14.VIII.1933, Issiki coll., 1972, gen. slide no. USNM-92451. Type deposited in USNM.

Distribution. Taiwan (Kaohshiung).

Remarks. The species was described from a single male from Taiwan, and no additional specimens have been found.



FIGURES 15–17. Female genitalia: 15, *Torodora manoconta* Wu & Liu, gen. slide no. CIS-4109; 16, *T. babeana* **sp. nov.** gen. slide no. CIS-5233; 17, *T. rectivalvata* **sp. nov.** gen. slide no. CIS-5244. Scale: 1 mm.

***Torodora babeana* Park, sp. nov.**
(Figs. 5, 12, 12a, 16)

Type. HOLOTYPE ♂, Cuc Phuong Nat. Park, 200 m, Ninh Vinh Prov., Vietnam, 11–12.VI.2004 (K.T. Park & N. Cuong), gen. slide no. CIS-5242. PARATYPES. 1♂, same data as holotype, gen. slide no. CIS- 5247. 1♂, same locality, 450 m, 24.IV.2006 (Park, Kim, Kang), gen. slide no. CIS-5243. 3♂, 1♀, Ba Be Nat. Park, Bac Khan Prov., 26–28.VII.2006 (Park, Chae, & Cuong), gen. slide no. CIS-5248 (♀). Types deposited in CIS.

Diagnosis. This new species is similar to *T. chinanensis*, *T. vietnamensis* **sp. nov.**, and *T. manoconta* Wu & Liu. It can be distinguished from them only by features of the male genitalia: apex of uncus smaller, less expanded laterally; lateral lobe of juxta digitate with serrate edge preapically; cornuti a long spine, about 1/3 length of aedeagus and shorter one forming a round plate with spines.

Description. Male. Forewing length 19–20 mm. Head shiny, pale brownish yellow, with concolorous erect scales laterally. Antenna with pedicel pale brownish orange, shiny dorsally; flagellum pale brownish orange throughout, with pale brownish annulations. Second segment of labial palpus rather slender, pale brownish orange all around; 3rd segment as long as second, dark brown ventrally. Tegula and thorax shiny golden brown. Forewing ground color shiny golden brown, often with large yellowish triangular or elongate patch near 2/3 on inner margin; apex somewhat round; termen less oblique; fringe golden brown. R_3 stalked at

basal 1/3; R_4 and R_5 stalked beyond basal 4/5; R_5 to termen; M_1 close to R_{3+4+5}at base; M_2 and M_3 connate at base; M_3 and CuA_1 stalked for 1/2, sometimes fro 2/3 length. Hindwing pale yellowish brown; apex acute; M_3 and CuA_1 stalked mesially, sometimes near basal 1/3 length; fringe golden brown. Hind tibia with dark brown hairlike setae preapically.

Male genitalia (Figs. 12, 12a). Uncus with clavate apex, somewhat rounded. Gnathos strongly bent downwardly. Valva foot-shaped, costa gently concave mesially. Juxta with heavily sclerotized, crescent-shaped median flap; flap often concealed on slide-mounts (see Fig. 12). Lateral lobe of juxta digitate, serrate preapically on outer margin. Aedeagus with a pair of cornuti: longer one spine-shaped, slender, about 1/3 length of aedeagus; shorter one with large round plate basally, with few spines.

Female genitalia (Fig. 16). Eighth sternum deeply emarginate at middle. Apophysis anterioris very short. Antrum poorly defined. Ductus bursae broad, with heavily sclerotized plates of variable shape in distal half. Corpus bursae ovate; signum elliptical, a heavily sclerotized plate with many spinules on surface, shorter than 1/4 length of corpus bursa.

Distribution. Vietnam (North).

Etymology. The species name is derived from the geographic locality of four of the paratypes, Ba Be, Vietnam.

Torodora spinula Park, 2002
(Figs. 6, 13, 13a)

Torodora spinula Park, 2002. Ins. Koreana 19: 154, fig. 24. TL: Chiang Mai, Thailand.

Diagnosis. Forewing length 13.0–13.5 mm. This species is one of the smallest in the *manoconta* species-group. The forewing ground color is paler than most members of the group. It can be distinguished from other species of the group by features of the male genitalia.

Male genitalia (Figs. 10, 10a; also see Park, 2002: fig 24). Entire structure similar to other members of the group, but easily distinguished by the funnel-shaped uncus; valva with a short spine on outer margin; and juxta with short, somewhat triangular latero-caudal lobes, with a sclerotized crescent-shaped median flap.

Material examined. Thailand: 1♂, Nakohn Nayok, Kao Yai, 800 m, 24.IX.1987, gen. slide no. CIS-5246.

Distribution. Thailand (Chiang Mai, Nakhon Nayok).

Torodora rectivalvata Park, sp. nov.
(Figs. 7, 14, 14a, 17)

Type. HOLOTYPE ♂, Chiang Mai, Doi Inthanon, ca. 1300 m, Thailand, 30.V.1983 (Kurok Moriuti, Arita, & Yoshiyasu), gen. prep. no. CIS-4960. PARATYPE. 1♀, same locality, 1, 3.XI.1985 (Moriuti, Saito, & Arita), gen. prep. no. CIS-5244.

Diagnosis. *Torodora rectivalvata* is superficially similar to *T. spinula* but the ground color of the forewing is paler than any other species. The male genitalia provide the most diagnostic differences: valva with the costa nearly straight in the basal half, and the distal part nearly triangular; and the juxta with a heavily sclerotized, large triangular median flap.

Description. Male and female. Forewing length 17.5–18.0 mm. Head grayish orange. Tegula and thorax brownish orange. Antenna with pedicel pale brownish orange, shiny dorsally; flagellum pale brownish orange throughout, without clear annulations. Second segment of labial palpus brownish orange on outer surface, paler on inner surface; 3rd segment as long as second, dark brown ventrally. Forewing elongate, broader

towards apex; ground color shiny brownish orange, often with large pale orange, quadrate area mesially on upper surface; apex obtuse; termen oblique, slightly concave mesially; fringe golden brown at basal half, paler beyond. R_3 stalked at basal 1/3; R_4 and R_5 stalked beyond basal 2/3; R_5 to termen; M_1 close at base; M_2 and M_3 connate at base; M_3 and CuA_1 stalked near basal 1/3. Hindwing pale yellowish brown; apex acute; M_3 and CuA_1 stalked beyond 2/3; fringe golden brown. Hind tibia with brownish hairlike setae in distal half dorsally.

Male genitalia (Figs. 14, 14a). Eighth sternum broadly convex, spinous zone dense and narrow. Uncus funnel-shaped; caudal margin nearly straight. Ganthos broad basally, strongly curved beyond middle. Costa of valva nearly straight, without subbasal expansion; distal part almost triangular, narrowed toward apex. Juxta with short, digitate or triangular lateral lobes, widely separated; median flap well developed, free, large, triangular, heavily sclerotized. Aedeagus short; with a pair of bar-shaped cornuti of comparable length, one thin, one much stouter.

Female genitalia (Fig. 17). Eighth sternum slightly emarginate at middle. Apophysis anterioris very short. Ostium bursae broad; anterior margin concave. Antrum heavily sclerotized, long, broad, about as long as ductus bursae. Ductus bursae membranous, narrow. Corpus bursae ovate, large; signum strawberry-shaped, with numerous conical spines on surface, about 1/4 as long as corpus bursa.

Distribution. Thailand (Chiang Mai)

Etymology. The species name is derived from the Latin, *rectus* (= straight), referring to the straight costa of the valva.

Discussion

Torodora Meyrick is a large genus of more than 100 species. Because of its morphological diversity, some character states overlap with those of related genera. Within the genus there is considerable variation in wing venation and male genitalia structures. For example, *T. silvatica* Park, 2007 has forewing veins M_3 and CuA_1+CuA_2 on a common stalk, identical to that of the genus *Thubana*; however, its male genitalia are similar to those of *Torodora parotidosa* Wu. In *T. moriyasu* Park, 2002, *T. sagmaria* Park, 2002, and *T. chiangdoica* Park, 2002, all from Thailand, the anterior margin of the 8th sternum has a unique median expansion with a short lateral processes; *T. fuscobasalis* Park, 2002, has valva that deviate considerably in shape from those of most members of the genus. The seven species of the *Torodora manoconta*-group can be distinguished from other members of the genus by the yellowish white head, shiny elongate forewing, and male genitalia structure; many are superficially indistinguishable from each other.

Acknowledgements

The author thanks Dr. Pham Vuong, National Institute of Plant Protection, Hanoi, Vietnam, who provided support for collecting in Vietnam, and Dr. T. Hirowatari, Osaka Prefecture University, Japan, for the loan of material in his care. I thank the Korea Science and Engineering Technology for providing financial support for this international collaborative work (KOSEF 2004-2006). This study was also supported in part by the Institute of Agricultural Sciences, Kangwon National University, Korea. I also am indebted to three graduate students, M.Y. Kim, S.R. Kim, and M.Y. Chae, for their help in collecting, preparing specimens, and taking photographs of moths and their genitalia.

References

Gozmány, L. (1978) Lecithoceridae. *In*: Amsel, H.G., Gregor, F., Reisser, H. (Eds.), *Microlepidoptera Palaearctica*. 5. Georg Fromme & Co., Wien. 306 pp,

Diakonoff, A. (1967) *Microlepidoptera of Philippine Islands*. *Bulletin of the U.S. national Museum,* 257, 125–147.

Koenerup, A. and Wanscher, J. H. (1983) *Methuen Handbook of Colour.* 3rd ed. Methuen and Co. Ltd., London. 252 pp.

Park, K.-T. (2002) Taxonomic review of the genus *Torodora* Meyrick in Thailand, with descriptions of fifteen new species (Lepidoptera, Lecithoceridae). *Insecta Koreana*, 19(2), 147–166.

Park, K.-T. (2003) Three new species of Lecithoceridae (Lepidoptera) from Taiwan. *Journal of Asia-Pacific Entomology,* 6(1), 15–19.

Park, K.-T. (2007) Three new species of *Torodora* Meyrick from Thailand (Lepidoptera). *SHILAP Revista de Lepidopterologia,* 35(137), 1–6.

Park, K.-T. & Heppner, J. (2000) Lecithoceridae (Lepidoptera) of Taiwan (III). Subfamily Torodorinae: genus *Torodora* Meyrick. *Transactions of the Lepidopterological Society of Japan,* 51(4), 287–297.

Wu, C. (1997) *Lepidoptera Lecithoceridae*. Fauna Sinica (Insecta) 7. Science Press, Beijing, 306 pp.

Wu, C. & Liu, Y. (1994) A study of the genus *Torodora* Meyrick, 1894 and description of new species. *Sinozoologica*, 11, 155–173.