



Two new species of *Fibuloides* Kuznetsov, 1997 (Lepidoptera: Tortricidae) from Thailand

NANTASAK PINKAEW^{1,2,4} & AIHUAN ZHANG^{3,4}

¹Department of Entomology, Faculty of Agriculture at Kamphaeng Saen, Kasetsart University, Nakhon Pathom, Thailand 73140.
E-mail: agrnsp@ku.ac.th

²Center for Advanced Studies in Tropical Natural Resources, NRU-KU, Kasetsart University, Chatuchak, Bangkok, 10900, Thailand

³Beijing Key Laboratory for Agricultural Application and New Technique, College of Plant Science and Technology, Beijing University of Agriculture, Beijing 102206, P. R. China. E-mail: zhangaihuan@126.com

⁴Both authors contributed equally to this work

Abstract

Two new species of *Fibuloides* Kuznetsov, 1997, *F. geniculata* Pinkaew and Zhang, **n. sp.**, and *F. khaoyai* Pinkaew and Zhang, **n. sp.**, are described and illustrated from Thailand. The two new species bring to 11 the number of *Fibuloides* documented from Thailand.

Key words: Eucosmini, *Fibuloides*, new species, Olethreutinae, Tortricidae

Introduction

Fibuloides was proposed by Kuznetsov (1997) with *F. modificana* Kuznetsov from South Vietnam designated as the type species. The characters of *Fibuloides* given by Kuznetsov are as follows: male costal fold narrow; forewing with R₄ and R₅ stalked and R₃ at base close to this stem; CuA₁ strongly curved and originating from near base of M₃; and hindwing with M₃ and CuA₁ stalked (Kuznetsov, 1997). Horak (2006) stated that the monophyly of *Fibuloides* is supported in the male by a dorsal notch at the base of the antenna, the distal portion of the gnathos forming paired rising bands, and the valva with a large basal excavation and long flattened bristles from its outer surface, and in the female by a spinulose sterigma and a two-pronged anterior sclerite in the ductus bursae. Nine species of *Fibuloides* have been recorded from Thailand: *F. cyanopsis*, *F. corinthia*, *F. euphlebia*, *F. japonica*, *F. macrosaris* were reported by Kawabe (1989); *F. bicucullus*, *F. vanevae*, and *F. munda* by Pinkaew *et al.* (2005); and *F. khaonanensis* by Pinkaew (2008). In this paper, two new species from Thailand, *F. geniculata* Pinkaew and Zhang, **n. sp.**, and *F. khaoyai* Pinkaew and Zhang, **n. sp.**, are described as new to science, bringing the number of Thai species to 11.

Materials and methods

This study is based on the examination of specimens collected with a 20-watt blacklight operated from a car battery. Latitude and longitude were recorded with a Magellen GPS315. An Olympus SZ30 stereomicroscope was used to examine and measure the specimens. Forewing length was measured from outer edge of the tegula at the wing base to the outermost edge of the fringe scales at the apex. An Olympus CH2 compound microscope was used for examining microtrichia, cornuti, and other characters of the genitalia. Terminology for forewing pattern elements follows Brown and Powell (1991) as refined by Baixeras (2002). Methods of genitalia dissection were adapted from Common (1990). Adults and genitalia were photographed with an Olympus DP70 camera using DP Controller and DP Manager software with a stereomicroscope (Leica MZ8) and a compound microscope (Leitz

Diaplan), respectively. All photographs were adjusted by Helicon Focus and Photoshop. The following abbreviations were used for depositories: ANIC, Australian National Insect Collection, Canberra, Australia; and KKIC, Kasetsart Kamphaengsaen Insect Collection, Nakhon Pathom, Thailand.

***Fibuloides geniculata* Pinkaew and Zhang, n. sp.**

(Figs. 1A–B, 2, 3A, 4A)

Diagnosis. This species can be easily distinguished from all other species by a forewing with a wide, much darker band along the costa and a strongly upwardly curved phallus.

Description. Head: Upper frons light brown mixed with dark brown, lower frons yellowish white; labial palpus with first segment light brown to brown with yellowish white dorsally, second segment dilated apically by scales, orange white with brown spots basally and dorsomedially, with patch of brown to dark brown at 2/3 length ventrally, apical segment light brown; vertex brown mixed with brownish gray; antenna light brown with dorsal notch at base of flagellum.

Thorax: Pronotal collar brown; tegula brown mixed with dark brown on basal 1/3; mesonotum brown mixed with grayish brown. Forewing (Figs. 1A–B) length 6.2 mm in male (n=1), 6.8 mm in female (n=1); male costal fold absent; dorsum half of wing with three tufts of raised scales medially; termen slightly concave below apex, with yellowish white spot between R_5 and M_1 on termen and dark brown narrow line along margin extending from R_5 to CuA_1 ; costal strigulae 2–9 paired, yellowish white and separated by dark brown spots, strigula 1 indistinct, with oblique silvery striae from strigulae 5–8 to R_4 and a short silvery stria from strigula 9 to R_5 ; fasciae present as dark brown spots on costa; ground color pale yellowish gray intermixed with light brown, with large patch extending from costa to M_1 , dark grayish brown, darker on apical half, wing apex dark brown. Underside light brown, strigulae on costa and termen yellowish white. Hindwing in male with modified, narrow anal area, light grayish brown with dense fringe of large, blackish brown scales along base of anal margin; unmodified in female.

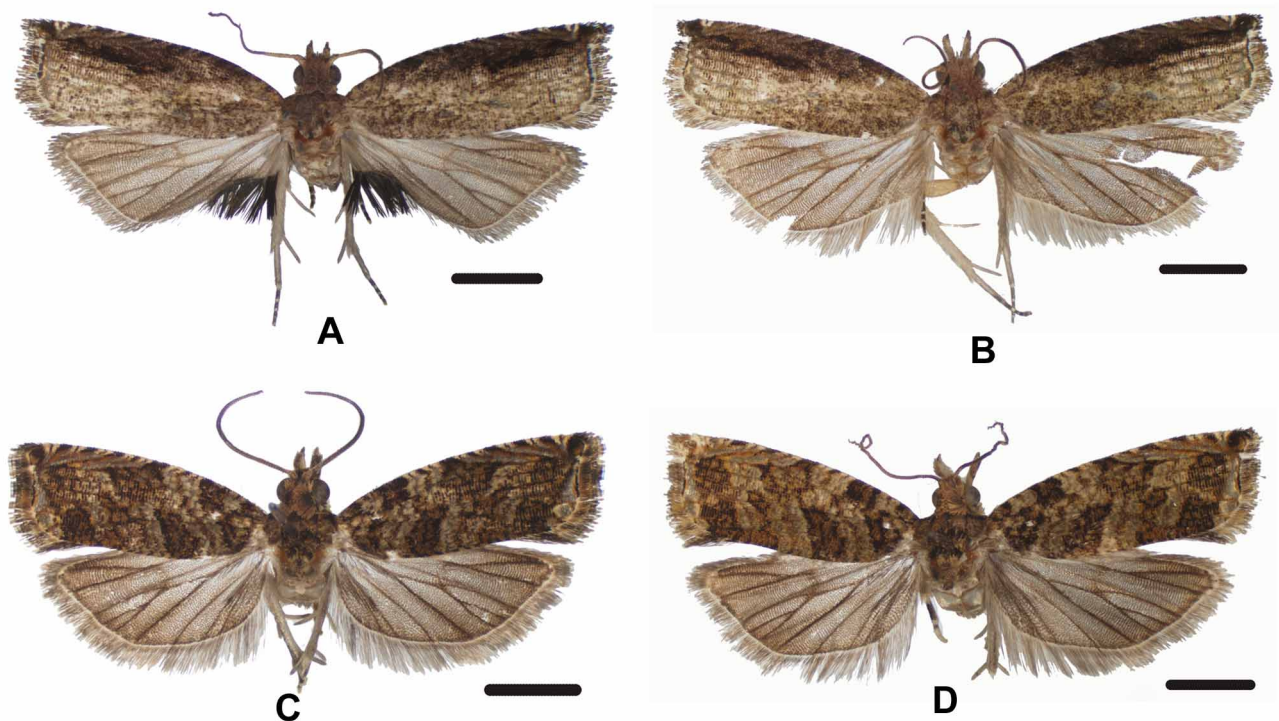


FIGURE 1. Adults of *Fibuloides* spp. (Scale bar = 2 mm). A. *F. geniculata* Pinkaew and Zhang, n. sp. (holotype, male). B. *F. geniculata* Pinkaew and Zhang, n. sp. (paratype, female). C. *F. khaoyai* Pinkaew and Zhang, n. sp. (holotype, male). D. *F. khaoyai* Pinkaew and Zhang, n. sp. (paratype, female).

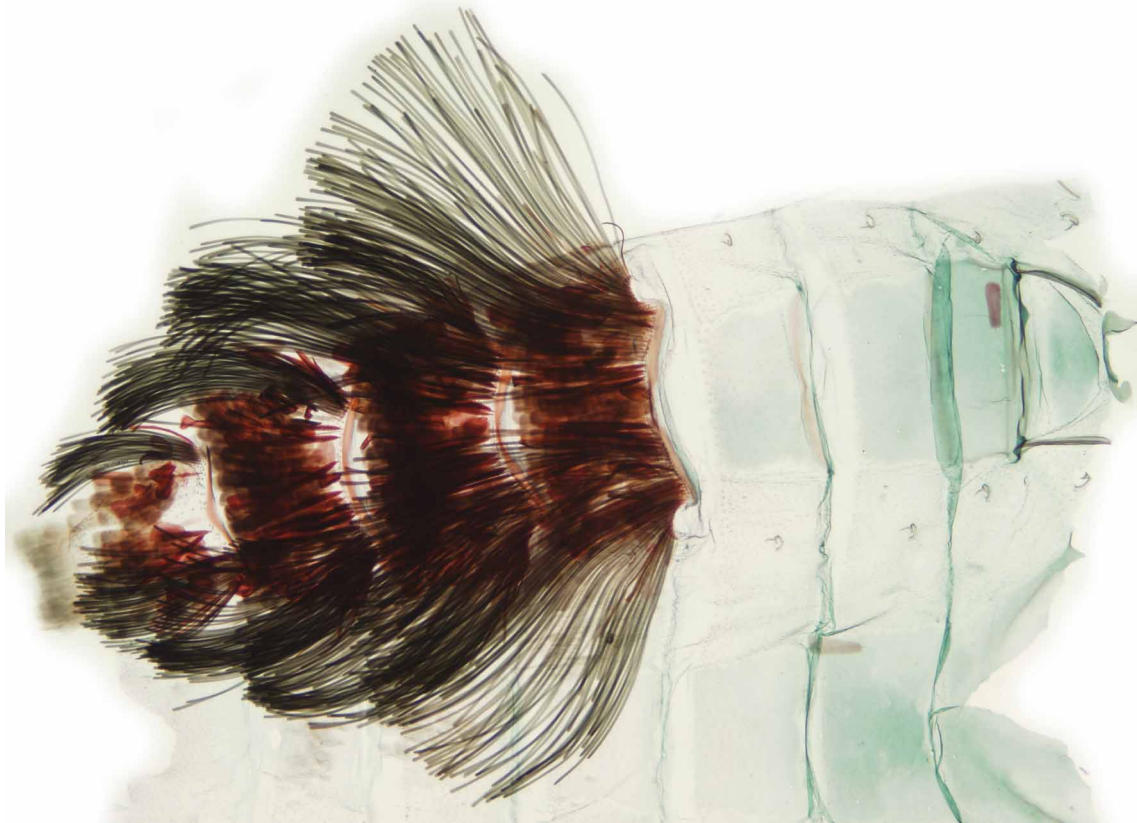


FIGURE 2. Sex scales on abdomen of male of *Fibuloides geniculata* Pinkaew and Zhang, **n. sp.** (KKIC slide no. NP 1530).

Abdomen (Fig. 2): Male tergum V–VIII with two kinds of modified scales: long and slender scales in a narrow anterior band and short and swollen scales posteriorly. Male genitalia (Fig. 3A) with tegumen narrowly subtriangular with angled shoulders, with group of dense setae posteriorly in dorsal 2/3. Uncus slender, bifid and flaring at apex with tips, curved outwardly. Socii small, short, pendant apically rounded, densely setose. Gnathos rising from about ventral 1/3 length of tegumen, moderately sclerotized, distally converging. Valva with large basal excavation and short, moderately slender neck; sacculus sparsely setose basally; outer surface of valva with enlarged, flattened bristles from end of sacculus to neck, some very large and twisted; cucullus sub-triangular, rounded dorsally, acutely angled ventrally and ending in a short stout spine, inner surface densely setose as neck. Anellus loosely surrounding base of phallus, cuplike dorsally; phallus moderately long, tapering towards apex, sharply upwardly bent by 90° at 2/5 from base, with several deciduous cornuti; juxta triangular, truncate ventrally. Female genitalia (Fig. 4A) with papillae anales densely setose; apophyses posteriores as long as apophyses anteriores; sternum VII with entrance to ostium in deep, U-shaped emargination of posterior margin, densely scaled, with microtrichia and sparse setae on sternum VII and emargination, with slightly curved transverse ridges anterior to ostium; lamella postvaginalis with spinulose patch; ostium bursae located near anterior margin of sternum VII, colliculum small; ductus bursae short, with longitudinal ridged sclerotized plate, inner surface medially with group of sparse spinules, anteriorly bifurcate with the blunt apex extending into corpus bursae; ductus seminalis arising from middle of ductus bursae. Corpus bursae ovate, spinulose except anteriorly and in area around signa; two signa of differing size, blade-shaped, gradually tapering to sharp point.

Holotype. ♂. Thailand: Chanthaburi Prov.: Khao Kluea, 13°05'49"N 102°10'21"E, 166 m, 17 May 2009, N. Pinkaew; np 3083; KKIC slide no. NP 1530. Deposited in KKIC.

Paratypes. Thailand: Chanthaburi Prov.: 1 ♀, Khao Kluea, 13°05'49"N 102°10'21"E, 166 m, 17 May 2009, (KKIC genitalia slide NP 1531 ♀), N. Pinkaew. Deposited in KKIC.

Distribution. Thailand (Chanthaburi).

Etymology. The specific name is derived from Latin *geniculatus* (= bent knee), referring to the shape of the phallus.

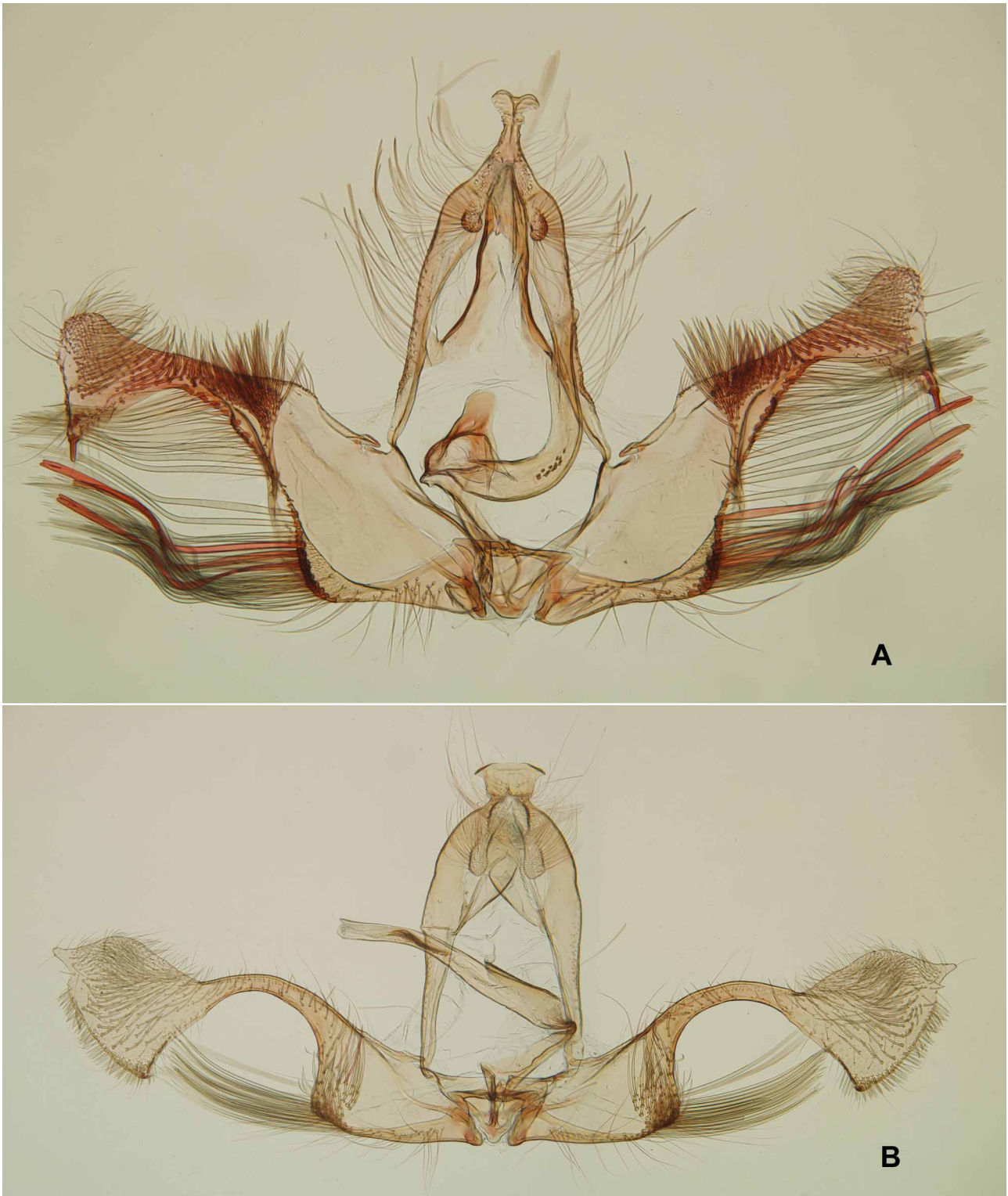


FIGURE 3. Male genitalia of *Fibuloides* spp. A. *F. geniculata* Pinkaew and Zhang, n. sp. (KKIC slide no. NP 1530). B. *F. khayoi* Pinkaew and Zhang, n. sp. (KKIC slide no. NP 1528).

Remarks. Two specimens from Australia have genitalia (ANIC genitalia slide No13724♂ and No13725♀) identical to those from Thailand and only a few differences in forewing coloration. However, the large blackish brown fringe scales present at the base of the anal margin in the hindwing of the single Thai male is absent in the single Australian male. Because male sex scales are involved in producing scents for mating, the Australian specimens are not considered conspecific with the species described here.



FIGURE 4. Female genitalia of *Fibuloides* spp. A. *F. geniculata* Pinkaew and Zhang, **n. sp.** (KKIC slide no. 1531). B. *F. khaoyai* Pinkaew and Zhang, **n. sp.** (KKIC slide no. 1529).

***Fibuloides khaoyai* Pinkaew and Zhang, n. sp.**

(Figs. 1C–D, 3B, 4B)

Diagnosis. This species is most similar to *F. vaneae* Pinkaew in forewing pattern, but differs in the shape of the uncus and cucullus. The broad, scoop-shaped uncus and the nearly rhomboid-shaped cucullus of *F. khaoyai* contrast with the slender, deeply bifid uncus and the long and narrow cucullus of *F. vaneae*.

Description. Head: Upper frons brown mixed with dark brown laterally, lower frons yellowish white; labial palpus with first segment orange white with dark brown spot apically, second segment orange white with dark brown spots basally and apicodorsally, with transverse dark brown band medially, apical segment small, orange white; vertex brown mixed with dark brown laterally.

Thorax: Pronotal collar brown; tegula brown mixed with dark brown on basal 1/3; mesonotum brown mixed with dark brown. Forewing (Fig. 1C–D) length 5.6 mm in male (n=1), 6.8 mm in female (n=1); male costal fold absent; ground color orange white mixed with brownish gray; costal strigulae orange white, strigulae 1–2 indistinct, 3–9 paired and separated by dark brown; termen with orange white strigula between R_5 and M_1 , and dark brown narrow line from R_5 to CuA_1 ; basal fascia indistinct, with dark brown spot divided by orange white scales between costa and R and irregular rows of dark brown between R and inner margin; subbasal fascia distinct on costa between strigulae 2 and 3 and extending to near middle of discal cell, dislocated apically between middle of discal cell and inner margin, brownish orange mixed with grayish orange, margined by dark brown; median fascia extending obliquely from costa between strigulae 4 and 5 to R_5 , widened at R_5 and extending transversely to 1A+2A, dark brown mixed with orange, broken by ground color at M-stem in discal cell; pretornal with a subtriangular spot, dark brown mixed with orange surrounded by dark brown on proximal and distal margins; postmedian fascia extending obliquely from costa between strigulae 6 and 7 to R_5 near outer margin, brown to dark brown mixed with orange, strigulae 5 and 6 with silvery striae becoming confluent extending obliquely to R_5 , strigulae 7 with silvery striae extending obliquely to R_5 , strigulae 8 and 9 with short silvery striae, outer margin with silvery striae extending from M_2 to CuA_2 ; ocellar region with dark brown patch between R_5 and CuA_1 . Underside light brown with yellowish gray striae on costa and on termen. Hindwing brown dorsally, light brown ventrally.

Abdomen: Male genitalia (Fig. 3B) with tegumen narrow basally, gradually broader to top, parallel-sided in basal half, dorsally rounded, with sparse setae. Uncus broad, short and flat, blunt apices, bending outwardly. Socii slender, apically rounded, originating from base of uncus, pendant to 1/4 of tegumen length, moderately setose. Gnathos arising from about half of tegumen, weakly sclerotized. Valva with relatively small basal excavation, ventral margin concave between sacculus and cucullus and produced into slender curved neck; sacculus sparsely setose basally, with enlarged flattened bristles on sacculus angle; neck with dense hairs; cucullus nearly rhomboid-shaped, with hairs and slender spines, round dorsally and with a small triangular salient, nearly right-angled ventrally. Anellus closely surrounding basal 2/5 of phallus; phallus moderately long, only slightly curve at distal 1/3, with several deciduous cornuti; juxta triangular, truncate ventrally. Female genitalia (Fig. 4B) with papillae anales densely setose; apophyses posteriores slightly shorter than apophyses anteriores. Sternum VII densely scaled especially on posterior margin except anteromedially half, anterolaterally with patch of densely microtrichiate, posterior margin of sternum VII slightly concaved medially, membrane between sternum VII and VIII with dense microtrichia. Ostium bursae located on posterior margin of sternum VII. Antrum sclerotized forming a large cup-shaped. Ductus bursae moderately long with large sclerotized plate slightly extending into corpus bursae, inner surface with group of moderately dense spinulose medially; ductus seminalis arising from nearly anterior end of ductus bursae. Corpus bursae ovate, narrower at anterior 1/4, spinulose except anterior end and area around signa; two blade-shaped signa, widest beyond middle and tapering to sharp point.

Holotype. ♂. Thailand: Nakhon Nayok Prov.: Khao Yai N.P., 14°21'49"N 101°24'37"E, 1,140 m, Hill Evergreen Forest, 14 June 2010, N. Pinkaew; np 4492; slide no. NP 1528. Deposited in KKIC.

Paratype. Thailand: Nakhon Nayok Prov.: Khao Yai N.P., 14°21'49"N 101°24'37"E, 1,140 m, Hill Evergreen Forest, 14 June 2010, (1 ♀, genitalia slide NP 1529), N. Pinkaew. Deposited in KKIC.

Distribution. Thailand (Nakhon Nayok).

Etymology. The specific name is named for Khao Yai National Park, referring to the type locality.

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Literature cited

- Baixeras, J. (2002) An overview of genus-level taxonomic problems surrounding *Argyroploce* Hübner (Lepidoptera: Tortricidae), with description of a new species. *Annals of the Entomological Society of America*, 95, 422–431.
- Brown, R.L. and Powell, J.A. (1991) Descriptions of a new species of *Epiblema* (Lepidoptera: Olethreutinae) from coastal redwood forests in California with an analysis of the forewing pattern. *Pan-Pacific Entomologist*, 67, 107–114.
- Common, I.F.B. (1990) *Moths of Australia*. Melbourne University Press, Melbourne. 535 pp.
- Horak, M. (1991) Morphology, pp. 1–22. In Van der Geest, L.P.S. and Evenhuis, H.H. (eds.), *Tortricid Pests, Their Biology, Natural Enemies and Control*, World Crop Pests, Amsterdam.
- Horak, M. (2006) Olethreutine moths of Australia (Lepidoptera: Tortricidae). *Monographs on Australia Lepidoptera*, 10, 1–522.
- Kawabe, A. (1989) Records and descriptions of the subfamily Olethreutinae (Lepidoptera: Tortricidae) from Thailand. *Microlepidoptera of Thailand*, 2, 173–191.
- Kuznetsov, V.I. (1997) New species of tortricid moths of the subfamily Olethreutinae (Lepidoptera, Tortricidae) from the south Vietnam. *Entomologicheskoe Obozrenie*, 76(4), 797–812. [In Russian].
- Pinkaew, N., Chandrapatya, A. and Brown, R.L. (2005) Two new species and a new record of *Eucoenogenes* Meyrick (Lepidoptera: Tortricidae) from Thailand with a discussion of characters defining the genus. *Proceedings of the Entomological Society of Washington*, 107, 869–882.
- Pinkaew, N. (2008) A new species and two new combinations in the genus *Fibuloides* Kuznetsov (Lepidoptera: Tortricidae: Eucosmini) from Thailand. *Zootaxa*, 1688, 61–65.