New Records of Seven Eupithecia (Lepidoptera: Geometridae) from Korea

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INTRODUCTION

The genus Eupithecia Curtis is one of the most species-rich taxa of Lepidoptera, comprising more than 1,500 species worldwide (Scoble, 1999). The adults of Eupithecia are relatively small in size (wingspan ranging from 12 to 35 mm), have cryptically colored grayish and brownish forewing, and indistinct basal, ante- and postmedial transverse lines mostly with a definite discal spot on the forewing. Forty-four species have been reported so far in Korea. Herein, we present the first report on seven species of Eupithecia: Eupithecia rufescens Butler (1878), Eupithecia costiconvexa Inoue (1979), Eupithecia daemionata Dietze (1904), Eupithecia persuastrix Mironov (1990), Eupithecia actaeata Walderdorff (1869), Eupithecia suboxydata Staudinger (1897) and Eupithecia costimacularia Leech (1897). Diagnosis, descriptions and figures of the available species are provided.

Keywords: taxonomy, Eupithecia, Larentiinae, new records, Korea

SYSTEMATIC ACCOUNTS

Order Lepidoptera Linnaeus, 1758
Family Geometridae Stephens, 1829
Subfamily Larentiinae Duponchel, 1845
Tribe Eupitheciini Tutt, 1896
Genus Eupithecia Curtis, 1825

Eupithecia rufescens Butler, 1878 (Figs. 1A, 2A–C, G)
Eupithecia rufescens Butler, 1878: 445. TL: Japan, Yokohama.

Eupithecia larntimima Vojnits, 1974: 221, figs. 2a–e. TL: China, Prov. Chekiang [Zhejiang], West-Tien-Mu-Shan, 1,600 m.

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Material examined. South Korea: 1♂, GN, Hamyang-gun, Macheon-myon, Mt. Jirisan, 35°21′18″N, 127°38′08″E, 760 m, 7 Jun 2011, Choi SW; 1♀, JN, Muan-gun, Chung-gye-myon, Bokgil-ri, 34°54′08″N, 126°24′22″E, 21 m, 23 May 2007, Choi SW; 1♀, JJ: Jeju, Mt. Hallasan, 33°23′N, 126°28′E, 783 m, 2 Jun 2006, An JS; 2♂1♀, Jeju, Hawondong, Tamra Univ., 29 May 2011, Kim SS.

Diagnosis. This species can be characterized by the long projected labial palpi, the pale rusty brown ground color of the fore and hindwings, the dark brownish double undulating postmedial lines and relatively large brownish discal dot on the forewing, and the thick blackish medial lines and postmedial line of the hindwing. This species is similar to Eupithecia abietaria, but can be distinguished by the broad central fascia and double undulating postmedial lines of the forewing. The male genitalia can be diagnosed by the long, slender uncus, the large, cone-shaped papillae, the thick digitate anterior arm of the labides, the medially projected saccus, the long, slender valva with long, sclerotized costa, and the minute spinular cornuti of the vesica. The male genitalia of Eupithecia rufescens are similar to those of E. abietaria, but can be distinguished by the two closely located patches of spicules of corpus bursae.

Description. Wingspan 18–20 mm. Antennae filiform; frons trapezoid, covered with whitish and dark brown scales, which are projected below; labial palpi very long, three times the length of eye diameter, projecting forward, covered with dark brown scales. Body whitish. Forewing: ground color brown; basal line broad, brown, costally projected; antemedial line blackish; postmedial line blackish, costally and medially projected; small, black discal dot on antemedial line; central fascia brownish, costally tinged with white scales; termen dark brown. Hindwing: ground color brown; several straight, blackish basal and antemedial lines; postmedial line blackish, projected costally and medially; discal dot indistinct; termen dark brown. Male abdomen and genitalia: Octavals on 8th sternite long, incurved anteriorly, slightly tapered posteriorly and deep medial invagination...
with long lateral arm. Uncus long, strongly tapered, not bilobed; long anal tube; tegumen almost equal to length of vinculum; arm of labides digitiform and apically hairy; juxta with large reniform body, narrow neck, and semi-circular

head; saccus long, medially projected. Valva long, slender, membranous; costa slender, weakly sclerotized; saccus weakly projected basally. Aedeagus long, rod-shaped; cornuti in the form of minute spinular processes. **Female genitalia:** Papillae anales simple, weakly sclerotized, hairy; apophyses posteriores almost twice the length of apophyses anteriores; antrum broad, semi-circular; ductus bursae short, colliculum present; corpus bursae long, ovate, anterior half filled with large spicules.

**Distribution.** Korea, Taiwan, Japan, N. Thailand.

**Eupithecia daemionata** Dietze, 1904 (Figs. 1C, 2H)

*Eupithecia daemionata* Dietze, 1904: 339, Pl. 3, fig. 9. TL: Japan, Nikko.

**Material examined.** South Korea: 3 ♀, JN, Gurye-gun, Mt. Jirisan, 35°18′12″N, 127°33′34″E, 1,318 m, 26 May 2007, Choi SW; 1 ♀, JN, Gurye-gun, Mt. Jirisan, 35°18′02″N, 127°33′10″E, 1,370 m, 22 May 2008, Park M; 1 ♀, GN, Hamyang-gun, Macheon-myon, Mt. Jirisan, 35°21′18″N, 127°38′08″E, 760 m, 27 Apr 2007, Choi SW.

**Diagnosis.** This species can be characterized by the band-shaped central fascia bearing a costally bent antemedial line and a large black discal dot on the postmedial line of the forewing. This species is similar to *Eupithecia signigera*, but can be distinguished by the relatively broad central fascia with a costal band of the antemedial line of the forewing. The female genitalia can be diagnosed by the long corpus bursae that show a large patch of anterior spicules and linearly located large spicules. The female genitalia of *Eupithecia daemionata* are distinguishable from those of *E. signigera* by the long ovate corpus bursae with lateral opening of the ductus seminalis.

**Description.** Wingspan 17–20 mm. Antennae filiform; frons trapezoid, covered with brown and dark brown scales, slightly projected below; labial palpi covered with brown scales, long, twice the length of eye diameter, projecting well beyond frons. Body covered with brown and dark brown scales. Forewing: ground color brown; basal line thick, brown; antemedial line blackish, costally invaginated; postmedial line blackish, with weak costal invagination; large, black discal dot on postmedial line; central fascia band-shaped; termen dark brown with whitish undulating line. Hindwing: ground color brown; basal and antemedial lines blackish; postmedial line blackish, straight; discal dot small, black; termen dark brown. **Male genitalia:** Not examined. **Female genitalia:** Papillae anales simple, weakly sclerotized; apophyses posteriores almost three times the length of apophyses anteriores; antrum narrow; ductus bursae short, broad, with colliculum present; corpus bursae long, ovate, marked with semi-circular patch of small spicules and one scattered patch of large spicules; ductus seminialis open laterally.

**Distribution.** Korea, China (Shaanxi, Sichuan, Jilin), Taiwan, Russian Far East, Japan.

*Eupithecia persuastrix* Mironov, 1990 (Figs. 1D, 2I)

Material examined. South Korea: 1 ♀, Gwangju, Mt. Mudeungsan, 8 Sep 2002, Choi SW; 1 ♀, JN, Muan-gun, Mt. Seungdalsan, 34°54′N, 126°27′E, 22 Sep 2004, Choi SW; 1 ♀, JN, Muan-gun, Bokgil-ri, Chunggye-myOn, 34°54′08″N, 126°24′22″E, 21 m, 21 Sep 2008, Choi SW; 1 ♀, JJ, Seogwipo, Tamra Univ., 8 Oct 2009, Kim SS.

Diagnosis. This species can be characterized by the even-ly curved postmedial line and the white tornal dot on the forewing with a brown anterior half and the rest white and a large black discal dot in the middle. This species is similar to *Eupithecia tripunctaria*, but can be distinguished by the two colored central fascia of the forewing. The female geni-talia can be diagnosed by the short and broad ductus bursae and the long corpus bursae showing a small ovate anterior sac and a partly sclerotized triangular posterior sac. The fe-male genitalia of *Eupithecia actaeata* are distinguishable from those of *E. tripunctaria* by the anterior small ovate corpus bursae filled with dense spicules.

Description. Wingspan 19–21 mm. Antennae filiform; frons trapezoid, covered with light brown scales, projected be-low; labial palpi moderate, almost equal to the length of eye diameter, well projected beyond frons, covered with dark brown scales. Body whitish. Forewing: ground color brown; basal line broad, black, projected costally; antemedial line yellowish-white, with strong costal invagination; postme-dial line blackish, projected costally and medially; large, black discal dot on central fascia; inner half of central fascia brownish, with whitish outer half; termen dark brown with yellowish-white undulating line and whitish tornal dot. Hindwing: light brown; basal and antemedial lines light blackish; postmedial line blackish, medially projected; dis-cial dot small, black; termen blackish with yellowish-white undulating line. Male genitalia: Not examined. Female genitalia: Papillae anales simple, weakly sclerotized, hairy; apophyses posteriores almost twice the length of apophyses anteriores; antrum broad, semi-circular; ductus bursae short, broad, colliculum present; corpus bursae long, anteriorly ovate and densely filled with small spicules, posteriorly sac-shaped, sclerotized with ductus seminalis.

Distribution. Korea, Japan, Russian Far East.

*Eupithecia actaeata* Walderdorff, 1869 (Figs. 1E, 2J)

*Eupithecia bergunensis* Dietze, 1875: 248, Pl. 2, fig. 1. TL: Switzerland, Kanton Graubünden, Bergün.

*Eupithecia praemutilata* Inoue, 1958: (252), fig. 9; Pl. 34, fig. 22. TL: Japan, Kushiro, Shibecha.

Material examined. 1 ♀, South Korea, GW, Hwacheongun, Sanae-myOn, Mt. Gwangdeoksan, 19 Aug 2011, Kim SS.

Diagnosis. This species can be characterized by the dark brown ground color and costally sinuate central fascia and large blackish discal dot of the forewing. This species is similar to *Eupithecia kobayashtii*, but can be distinguished by the costally smooth curved postmedial line and large blackish discal dot on the forewing. The female genitalia can be diagnosed by the broad antrum with triangular lamel-la postvaginalis, the short ductus bursae and the long ovate corpus bursae, marked with a large patch of long and small spicules. The female genitalia of *Eupithecia actaeata* are distinguished from those of *E. tripunctaria* by the small ovate anterior corpus bursae filled with dense spicules.

Description. Wingspan 20 mm. Antennae filiform; frons slender, covered with brown scales, slightly projected be-low; labial palpi covered with brown scales, long, 1.5 times the length of eye diameter, projecting well beyond frons. Body covered with brown and dark brown scales. Forewing: ground color brown; basal line blackish, dentate; antemedial line blackish, costally invaginated; postmedial line blackish, medially projected; large, black discal dot on central fascia; central fascia broad, band-shaped; termen dark brown. Hindwing: ground color brown; basal and antemedial lines blackish; postmedial line blackish, medially projected; discal dot large, black; termen brown. Male genitalia: Not ex-amined. Female genitalia: Papillae anales simple, weakly sclerotized; apophyses posteriores almost twice the length of apophyses anteriores; antrum broad with triangular lamella postvaginalis; ductus bursae short, broad, colliculum absent; corpus bursae long, ovate, marked with a large patch of long and small spicules; ductus seminalis open laterally.

Distribution. Korea, China (Qinghai, Shannxi), Europe, Russia (Urals), Russian Far East, Japan.

Biology. Larva found on *Actaea* spp. (Ranunculaceae) (Mironov and Galsworthy, 2014).

Remarks. Mironov and Galsworthy (2014) noted the occurrence of this species in Korea without information of locality. Thus, the occurrence information on this species is pro-vided herein.

*Eupithecia suboxydata* Staudinger, 1897 (Figs. 1F, 2K–M)

*Eupithecia suboxydata* Staudinger, 1897: 112, Pl. 3, fig. 74. TL: Russia, Vladivostok, Askold, Suifum, Sutschan.

Material examined. 1 ♀, North Korea, Shuotsu (Jueul), 2 Jul 1935, Sten Bergman (NHRS).

Diagnosis. This species can be characterized by the trans-verse central fascia with thick dark brown ante- and post-medial lines and large blackish discal dot, and by the dark brown termen with a yellowish-white undulating line of the forewing and dark brown termen of the hindwing. This
species is similar to Eupithecia subbrunneata, but can be distinguished by the brownish ground color of the wings, large blackish discal dot of the forewing and dark brown termen of the fore- and hindwings. The male genitalia can be diagnosed by the bifurcated apex of the uncus, medially invaginated saccus, slender valva with large sacculus and the sclerotized plate-like cornutus of the vesica. The male genitalia of Eupithecia suboxydata are similar to those of E. subbrunneata, but can be distinguished by the broad rectangular saccus of the valva.

**Description.** Wingspan 21 mm. Antennae filiform; frons trapezoidal, covered with yellowish-whitish and brown scales; labial palpi short, almost equal length as eye diameter, covered with brown scales. Body brownish. Forewing: ground color brown; basal line blackish, dentate; antemedial line broad, dark brown; postmedial line broad, dark brown, medially projected; large, black discal dot on central fascia; central fascia with medial lines, projected medially; termen dark brown with yellowish-white undulating line. Hindwing: ground color brown; several dark brownish basal and antemedial lines, almost straight; postmedial line dark brownish, weakly waved; discal dot large, brown; termen dark brown. **Male abdomen and genitalia:** Octavals on 8th sternite large, anteriorly incurved, posterior medial projection with a pair of large triangular arms. Uncus slender, apex bilobed; long anal tube; tegumen almost equal to the length of vinculum; arm of labides broad digitiform and apically hairy; juxta with large reniform body, narrow neck, and semi-circular head; saccus long, broad, medially invaginated. Valva long, slender, membranous, hairy; costa slender, weakly sclerotized; sacculus basally expanded broadly. Aedeagus long, rod-shaped; cornutus in the form of large sclerotized plate-shaped process. **Female genitalia:** Not examined.

**Distribution.** Korea, China (Xinjiang, Shaanxi, Shanxi, Gansu, Qinghai, Sichuan, Beijing), Russian Siberia, Russian Far East, Kazhksatan, Kirghizstan, Mongolia, Japan.

**Biology.** Larva found on flowers of Artemisia santolinifolia (Asteraceae) (Mironov and Galsworthy, 2014).

**Remarks.** Mironov and Galsworthy (2014) noted the occurrence of this species in Korea without information of locality. Thus, the occurrence information on this species is provided herein.

**Eupithecia costimacularia** Leech, 1897 (Figs. 1G, 2N)

*Eupithecia costimacularia* Leech, 1897: 69. TL: Japan, Yokohama.

**Material examined.** 1♀, South Korea, JJ, Jeju, Mt. Hallasan, 33°22′11″N, 126°37′32″E, 636 m, 14 Apr 2007, Choi SW.

**Diagnosis.** This species can be characterized by the long labial palpi and the whitish color of the forewing, as well as the indistinct central fascia of forewing with large blackish markings on the costa, dark brown marking on the dorsum, large discal dot and dark brown termen of the forewing. This species is similar to *Eupithecia insignioides*, but can be distinguished by the whitish color of the wings and large blackish costal markings and brown termen of the forewing. The female genitalia can be diagnosed by the narrow antrum, short and narrow ductus bursae, and pear-shaped corpus bursae with the anterior 2/3 filled with minute spicules. The female genitalia of *Eupithecia costimacularia* are similar to those of *E. insignioides*, but can be distinguished by the smaller sac-shaped corpus bursae.

**Description.** Wingspan 19 mm. Antennae filiform; frons slender, covered with dark brown scales; labial palpi covered with brown scales, long, three times the length of eye diameter, projecting well beyond frons. Body covered with yellowish-white scales. Forewing: light brown; basal part costally marked with a black dot; antemedial line costally broad, blackish, merged with long blackish discal dot, medi ally indistinct; postmedial line dotted costally with blackish dots, medially indistinct; discal dot large, black; central fascia costally tinged with black dot, medially indistinct, dorsally dark brown; termen light brown with brown band. Hindwing: whitish; basal and antemedial lines blackish, dorsally tinged with brown scales; postmedial line blackish, medially projected; discal dot small, black; termen light brown. **Male genitalia:** Not examined. **Female genitalia:** Papillae anales simple, weakly sclerotized; apophyses posteriores almost twice the length of apophyses anteriores; antrum narrow; ductus bursae short, narrow, colliculum present; corpus bursae pear-shaped, anterior 2/3 filled with minute spicules; ductus seminalis open laterally.

**Distribution.** Korea, China (Guangxi, Guangdong, Hong Kong), Taiwan, Japan.

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**REFERENCES**


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