

Three species of Choreutidae (Lepidoptera) new to Korea with the first record of Brenthiinae for the country

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Three species of Choreutidae, *Choreutis atrosignata* (Christoph, 1888), *Choreutis japonica* (Zeller, 1877), and *Litobrenthia japonica* (Issiki, 1930), are reported for the first time from Korea. The records of *C. atrosignata* and *C. japonica* are based on two females from Yeongwol, Gangwon Province and from the Island Chujado, Jeju Province, respectively. The latter species was obtained from two larvae collected on the leaves of *Ficus erecta* (Moraceae). Photographs and data of rearing the larvae are provided. The record of *L. japonica* was based on two specimens collected from the Islands, Bogildo and Wando, Jeollanam Province. The present data of *L. japonica* represent the first record of the subfamily Brenthiinae and the genus *Litobrenthia* from Korea. Distributions of two species *C. japonica* and *L. japonica*, previously known only from Japan, now extends to Korea. Habitus and genitalia of the species treated here are briefly described and illustrated, if possible. To sum up, the Korean Choreutidae comprises four genera and 10 species, nine in Choreutinae and one in Brenthiinae.

Keywords: Brenthiinae, Choreutidae, *Choreutis*, Korea, *Litobrenthia*, new records

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INTRODUCTION

Choreutidae, also known as the Metalmark moths, are the beautiful microlepidopterans usually flying in daytime. These organisms were once confused with Glyphipterigidae due to similarities in the wing patterns and venation and diurnal habit, but the two groups differ in superfamily level (Heppner, 1977). The monophyly of Choreutidae has been corroborated by three probable autapomorphies: the presence of the scaled proboscis, the two-segmented, minute maxillary palps and the upright eggs (Heppner, 1982; Minet, 1991). The moth family currently includes 18 genera and 406 species occurring in all zoogeographical regions (Nieukerken *et al.*, 2011). The larvae are mostly external feeders (Scoble, 1992) on various angiosperms. However, the severe damage on economic plants caused by choreutids has been very rare (Park and Heppner, 2021).

The Korean species of Choreutidae comprise seven species in three genera (Kwon *et al.*, 2019; Park and Heppner, 2021). A species of Galacticidae, *Homadaula anisocentra* Meyrick was erroneously included in Choreutidae in the latest checklist of Korean insects (Kwon *et al.*, 2019). Among the Korean choreutids, *Tebenna issikii*

(Matsumura) is a pest species on economic herbs in Asteraceae, such as edible burdocks and chrysanthemums (Kim *et al.*, 2007). The species diversity of Choreutidae in Korea seems underestimated, given the estimates of the neighboring countries. In the present article, three newly-recorded species of Choreutidae in Korea are reported.

MATERIALS AND METHODS

Specimens examined were obtained from field collecting of larvae in Korea and three insect collections:

Department of Science Education, Gongju National University of Education, Korea (GNUE);
National Institute of Biological Resources, Korea (NIBR);
Tsukuba Research Departments, National Museum of Nature and Science, Japan (NMNS).

Dissection of genitalia followed Clarke (1941), except that chlorazol black and Euparal resin were used for staining and mounting medium, respectively. Terms for genitalia and wing venation followed Klots (1970) and Wootton (1979). The names of host plants followed the "Plant List" website (www.theplantlist.org).

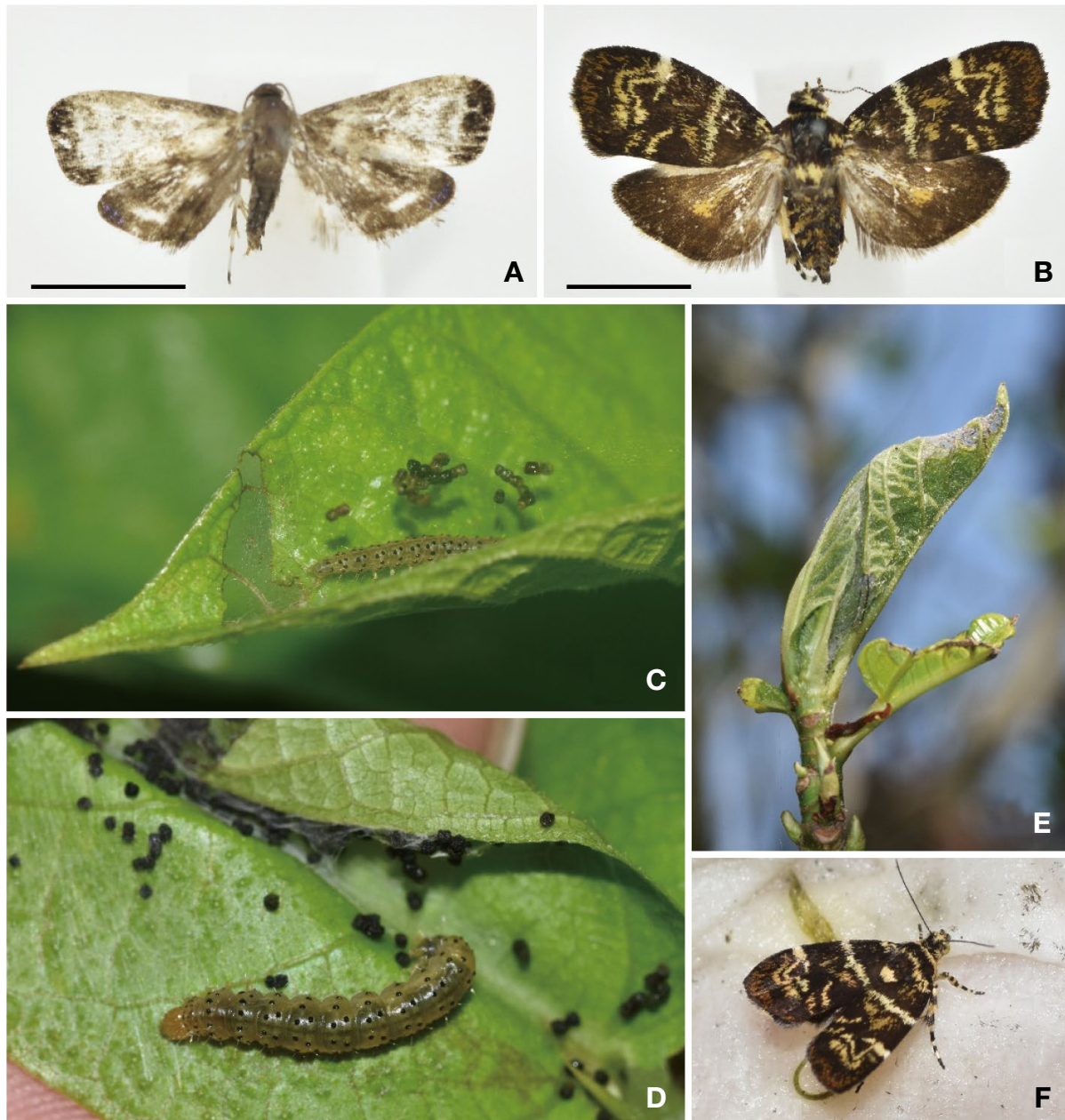


Fig. 1. Habitus (A–B) and life-cycle (C–F) of Choreutidae. A. *Litobrenthia japonica* (Issiki, 1930), male. B–F. *Choreutis japonica* (Zeller, 1877): B. female habitus, C. young larva on *Ficus erecta*, D. mature larva, E. larval shelter, F. emerged adult. Scale bars in A and B = 3 mm.

TAXONOMIC ACCOUNTS

Family Choreutidae Stainton, 1858
Subfamily Choreutinae Stainton, 1858

Choreutis atrosignata (Christoph, 1888)

느릅몽뚝날개나방 (Fig. 2D)

Simaethis atrosignata Christoph, 1888: 311. Type locality: Russia, Ussuri.

Simaethis moiwana Matsumura, 1931: 1080. Type locali-

ty: Japan.

Anthophila moiwana; Inoue, 1954: 49.

Hemerophila ussuriensis Danilevsky and Kuznetsov, 1973: 16. Type locality: Russia, Ussuri.

Eutromula atrosignata; Diakonoff, 1978b: 199.

Choreutis atrosignata; Heppner and Duckworth, 1981: 53.

Description. Head - Vertex and frons fuscous. Antenna 1/2 as long as forewing, dark fuscous, annulated with white. Labial palpus white, intermixed with dark brown

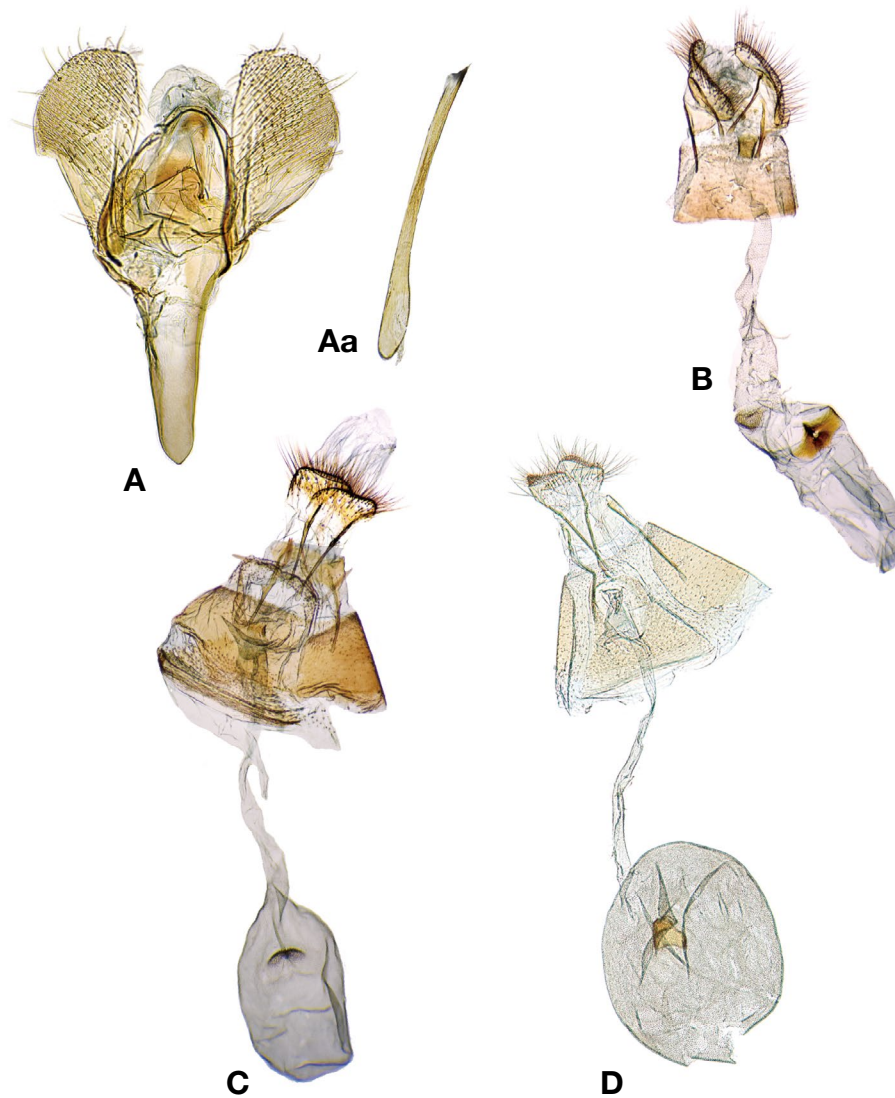


Fig. 2. Genitalia of Choreutidae. A. *Litobrenthia japonica* (Issiki, 1930), male (a = phallus). B. *Litobrenthia japonica* (Issiki, 1930), female. C. *Choreutis japonica* (Zeller, 1877), female. D. *Choreutis atrosignata* (Christoph, 1888), female.

scales on distal half. Thorax - Patagium, tegula and mesonotum fuscous. Forewing length 4.2 mm, brownish gray, tinged with dark fuscous basally and distally; ante-median and postmedian fasciae zigzagged, dark brown; cilia dark fuscous. Hindwing and cilia dark fuscous. Female genitalia (Fig. 2D) - Papillae anales subrectangular, long-setose. Apophyses posteriores as long as apophyses anteriores. Ostium bursae large, oval. Ductus bursae narrow, of even width along entire length. Corpus bursae globular; signum long-elliptical, with round expansions at middle, scobinate. See Arita (1987) for the characteristics of the male genitalia.

Material examined. [Korea] 2♀, Gangwon Prov., Yeongweol, Mt. Wantegsan, 7 June 2004, leg. J.-C. Sohn, genitalia slide no. SJC-508, GJUE.

Distribution. Korea (new record), Japan, Russia (Far East).

Host plants. Ulmaceae - *Ulmus davidiana* var. *japonica* (Rehder) Nakai (Arita, 1987).

***Choreutis japonica* (Zeller, 1877)**

천선과몽뚝날개나방 (Figs. 1B-F, 2C)

Simaethis japonica Zeller, 1877: 174. Type locality: Japan.

Anthophila japonica; Inoue, 1954: 48.

Eutromula japonica; Arita and Diakonoff, 1979: 18.

Choreutis japonica; Heppner and Duckworth, 1981: 54.

Description. Head - Vertex and frons dark fuscous, intermixed with pale orange scales laterally. Antenna 2/3 as

long as forewing, dark brown, annulated with white. Labial palpus brownish white, with two dark brown rings on 2nd and 3rd palpomeres. Thorax - Patagium dark fuscous; tegula brownish black, with pale-yellowish brown fascia basally and at distal 1/4; mesonotum brownish black, with pale-yellowish brown fascia at anterior 1/7 and middle; mesoscutellum pale-yellowish brown. Forewing length 5.2 mm, dark brown, darkened along costa; basal bar pale orange, irrorated with dark brown; antemedian fascia pale yellow; median patch orange, intermixed with dark brown scales; two postmedian fasciae undulate, yellowish orange; subterminal area brownish yellow, intermixed with dark brown scales; cilia pale-brownish gray, tinged with dark brownish gray at apex, middle and tornus. Hindwing dark brown; medial patch triangular, orange; cilia pale-brownish gray, tinged with brownish gray apically, tornally. Female genitalia (Fig. 2C) - Papillae anales subrectangular, long-setose. Apophyses posteriores 1.5 × longer than apophyses anteriores. Ostium bursae large, oval; lamella postvaginalis subquadrate, spinulate along marginal areas. Ductus bursae narrow, enlarged near corpus bursae; antrum as sclerotized ring. Corpus bursae obovate; signum as scobinate bulge at anterior 1/3. See Arita (1987) for the characteristics of the male genitalia.

Material examined. [Korea] 1♀, Jeju Prov., Is. Sangchujado, Mt. Bonguelesan, 24 July 2018 (larva collected on *Ficus electa*), 5 August 2018 (adult emerged), leg. J.-C. Sohn, rearing no. K613, GJUE; 1♀, ditto, 3 May 2019 (larva collected on *Ficus electa*), 15 May 2019 (adult emerged), leg. J.-C. Sohn, rearing no. K623, genitalia slide no. SJC-1310, NIBR.

Distribution. Korea (new record), Japan.

Host plants. Moraceae - *Ficus erecta* Thunb., *F. pumila* L. (this study; Arita, 1987).

Remarks. The adult moths were obtained from the larvae captured in the collecting sites and reared in the lab. The larva webbed the leaves of *Ficus electa* to make a shelter. It fed the inside of its nest and left droppings therein (Figs. 1C-E).

Subfamily Brenthiinae Heppner, 1981

The adults are commonly referred to as peacock moths, because of the presence of ocelli along the marginal area of forewings. This group is distinguished from the subfamily Choreutinae in the presence of the rounded forewings and the absence of the chorda in the forewing venation. These differences suggested their status as a separate subfamily, Brenthiinae (Heppner and Duckworth, 1981). In the other, Dugdale *et al.* (1999) pointed out the paraphyletic relationships between Choreutinae and Brenthiinae. A recent molecular phylogenetic study supported the monophylies of two subfamilies (Rota, 2011). Brenthiinae comprises two genera and 97 species mainly occurring in

tropics (Liu *et al.*, 2016). This subfamily is recorded for the first time from Korea.

Litobrenthia Diakonoff, 1978

Litobrenthia Diakonoff, 1978a: 28. Type species: *Brenthia japonica* Issiki, 1930.

This genus differs from *Brenthia* Clemens, 1860 in having the Rs₁ and Rs₂ stalked (separated in *Brenthia*) in the forewings. The host-plants of the larvae, whenever known, belong to Fagaceae. *Litobrenthia* currently includes 16 species occurring in the East Asia and Asian tropics (Liu *et al.*, 2016).

Litobrenthia japonica (Issiki, 1930)

육눈이몽뚝날개나방 (Figs. 1A, 2A-B)

Brenthia japonica Issiki, 1930: 424. Type locality: Japan, Wakayama Pref., Hasimoto.

Choreutis kiiensis Matsumura, 1931: 1078. Type locality: Japan.

Litobrenthia japonica; Diakonoff, 1978a: 29.

Description. Head - Vertex and frons fuscous, with purple luster. Antenna 1/2 as long as forewing; scape fuscous dorsally, white ventrally; flagellum fuscous, intermixed with white scales on basal 12 flagellomeres. Labial palpus with 1st palpomere pale fuscous; 2nd palpomere white, with fuscous ring at distal 1/3; 3rd palpomere white, with fuscous ring distally and basally. Thorax - Patagium, tegula and mesonotum fuscous. Forewing length 3.5–4 mm, fuscous; subbasal fascia broadly suffused, white; median fascia white, intermixed with fuscous scales; black terminal fascia divided into three large blotches, peppered with purplish-metallic scales subterminally; cilia pale fuscous. Hindwing fuscous, with white-suffused patch at middle and white bar at middle of postmedian area; a short, purplish-blue, metallic streak in apical area; cilia fuscous. Male genitalia (Fig. 2A) - Tegumen semi-elliptical. Tuba analis well-developed, with linguiform sclerotization. Transtilla with small, sparsely-setose, papiliform process laterally. Valva semi-oval, densely-setose. Saccus large, digitiform, narrowly-round apically. Phallus (Fig. 2Aa) slightly curved at middle; cornutal zone spinulate, 1/2 as long as phallus. Female genitalia (Fig. 2B) - Papillae anales oblique, densely-setose. Ductus bursae enlarged to corpus bursae; antrum cup-shaped, 1/10 as long as ductus bursae; corpus bursae obovate, as long as ductus bursae; signum near ductus bursae quadrate, scobinate; signum at posterior 1/3 large, transversely elongate, convex at middle on both margins.

Material examined. [Korea] 1♂, Jeollanam Prov., Wandogun, Is. Bogildo, Bogil-myeon, Buhwang-ri (34°07' 39.7"N 126°31'13.3"E), 31 August 2017, leg. J.-C. Sohn, genitalia slide no. SJC-1308, GJUE; 1♀, Jeollanam Prov.,

Wando-gun, Is. Wando, Wando-eup, Jeongdo-ri (34°17' 53.1"N 126°42'46.8"E), 24 August 2017, leg. J.-C. Sohn, genitalia slide no. SJC-1326, NIBR. [Japan] 2♂, 2♀, Honshu, Aichi Pref., Mt. Sanage-yama, 15 May 1980 (larvae collected on *Quercus glauca*), 29–31 May and 9 June 1980 (adults emerged), genitalia slide no. SJC-1313 (♀), 1205 (♂), NMNS.

Distribution. Korea (new record), Japan.

Host plants. Fagaceae - *Castanea crenata* Siebold & Zucc., *Lithocarpus edulis* (Makino) Nakai, *Quercus acuta* Thunb., *Q. acutissima* Carruth., *Q. gilva* Blume, *Q. glauca* Thunb., *Q. myrsinifolia* Blume, *Q. phillyreoides* A. Gray (Arita, 1987; 2013).

Remarks. Adults of this species exhibit display behavior in the similar way to *Brenthia* spp., described in Aiello and Becker (2004). It is known that such behavior is involved in jumping spider mimicry (Rota and Wagner, 2006).

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