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Three Species of the Subfamilies, Lithocolletinae and Ornixolinae (Lepidoptera, Gracillariidae), New to Korea

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ABSTRACT

The subfamilies Lithocolletinae and Ornixolinae belong to the family Gracillariidae (Lepidoptera). In this study, one species in the subfamily Lithocolletinae, *Neolithocolletis hikomonticola* Kumata, 1963 and two species in the subfamily Ornixolinae, *Conopomorpha flueggella* Li, 2011 and *Epicephala nudilingua* Kawakita & Kato, 2016 are reported for the first time from Korea. Also, two genera, *Neolithocolletis* Kumata, 1963 and *Conopomorpha* Meyrick, 1885 are reported as new to Korea. All available information of these taxa, including details on their host plants and distributional regions are provided with the descriptions and illustrations of the adults, male and female genitalia of these taxa.

Keywords: Gracillariidae, Lithocolletinae, Ornixolinae, new record, leaf-miner, Korea

INTRODUCTION

The subfamily Lithocolletinae, is the most diverse group in the family Gracillariidae with more than 907 described species in the world (De Prins and De Prins, 2006−2022). This subfamily can be distinguished from other subfamilies by its unique characteristics of the hindwing with the parallel condition of the vein Rs with the vein M_1 or M_{1+2} towards the base (Kumata, 1993). They are cosmopolitan group and most of them are distributed in the Palearctic regions with 298 recorded species, also 64 species in the Afrotropical region, seven species in the Australasian region, 152 species in the Nearctic region and 20 species in the Neotropical region (De Prins and De Prins, 2006−2022).

The subfamily Ornixolinae, is a relatively large group with more than 328 described species under 33 genera worldwide (De Prins and De Prins, 2006−2022). Recently, Kawahara et al. (2017) established this group from the *Parectopa* group sensu Kumata (1982) as a subfamily with the strongly supported monophyly results in phylogenetic study. Ornixolinae species are well characterized by a long four-segmented maxillary palpus, and the female genitalia antrum opens at the 7th sternite. They are cosmopolitan group and most of them are distributed in the Oriental regions with 74 recorded species, also 55 species in the Afrotropical region, 55 species in the Australasian region, 62 species in the Nearctic region, 31 species in the Neotropical region and 35 species in the Palearctic region, respectively (De Prins and De Prins, 2006−2022).

This study is aim to report three species of the subfamilies Lithocolletinae with *Neolithocolletis hikomonticola* Kumata, 1963 and Ornixolinae with *Conopomorpha flueggella* Li, 2011 and *Epicephala nudilingua* Kawakita & Kato, 2016, for the first time from Korea. Also, two genera, *Neolithocolletis* and *Conopomorpha* are new records from Korea in this study. The adults and genitalia structures of the taxa were redescribed and illustrated.

MATERIALS AND METHODS

The specimens examined in this study were deposited at the Systematic Entomology Laboratory, Hannam University, Daejeon, Korea (HNSUEL). Male and female genitalia were dissected and mounted with Euparal solution, following the procedure described by Holloway et al. (1987). Images of the adult were captured using a digital camera (Canon EOS 600D,

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Canon Inc., Ota, Tokyo, Japan). Images of the genitalia were captured using a digital camera attached to the microscope, LEICA M205C (Leica Microsystems, Wetzlar, Germany) and refined using an image editing software, Adobe Photoshop CS5.

Abbreviations in this study for the locality in Korea are as follows: GG, Gyeonggi-do; GW, Gangwon-do; GN, Gyeongsangnam-do; JN, Jeollanam-do; TL, Type locality; TD, Type depository.

Also, the specimen depositories in this study were examined from the following collections: EIHU, Entomological Institute, Hokkaido University, Japan; ELKU, Entomological Laboratory, Kyusyu University, Japan; HNUSEL, Hannam University, Systematic Entomology Laboratory, Korea; INU, Incheon National University, Korea; Hu, personal collecting; KNAE, Korea National Insect Collection, Korea National Arboretum, Korea; KYO, Kyoto University Museum, Japan; NAIST/NAAS, National Academy of Agricultural Science, Korea.

SYSTEMATIC ACCOUNTS

Order Lepidoptera Linnaeus, 1758
Family Gracillariidae Stainton, 1854

Subfamily Lithocolletinae Stainton, 1854
Type genus: Lithocolletis Hübner, 1825.
Lithocolletinae Stainton, 1854: 264.
Phyllorycteridae Walsingham, 1914.

Genus *Neolithocolletis* Kumata, 1963
Neolithocolletis Kumata, 1963: 21, 22.
Type species: *Neolithocolletis hikomonticola* Kumata, 1963.

Diagnosis. The genus is very closely related to the genus *Phyllonorycter* Hübner, 1822, but it can be identified and differentiated by shape of forewings. Terminal margin of forewing rather round and narrow. Also, vein R_3 position of forewing and male genitalia with one pair of processes on anellus in juxta.
Distribution. Afrotropical, Oriental, and Palearctic regions.
Remarks. Only five species in the genus *Neolithocolletis* have been reported worldwide. In addition, our study reports this genus and a species under this genus for the first time from Korea.

[1]***Neolithocolletis hikomonticola* Kumata, 1963 (Figs. 1A, 2A)**

Neolithocolletis hikomonticola Kumata, 1963: 19–22. TL: Kyushu, Japan. TD: ELKU (Holotype); ELKU, EIHU (Paratypes).

Material examined. 1 male, Korea: JN: Mt. Jogyesan, Suncheon-si, 4 Jul 2018 (leg. BK Byun), gen. slide no. HNUSEL-5645-coll. HNUSEL.
Redescription. Adult (Fig. 1A): Wingspan 5.5 mm. Head covered with silvery white scales and occiput with grayish fuscous; labial palpus white; antenna fuscous and each segment with one fuscous spot dorsally; scape white with small fuscous spots laterally. Thorax pale ochreous; legs white with fuscous spots on the apex of tarsus.

Forewing ground color golden ochreous with white fasciae; black edges on inner side of white fasciae; dorso-basal white; first white fascia on one fourth to base, slightly curved apically and nearly straight dorsally; second fascia at middle of forewing and broader than first one; third fascia at three fourths to base, straight to dorsum, concave on inner side, forming rounded margin, but outer margin of white fascia straight; one short white apical stria reached to median without distinct blackish edge; many tiny blackish spots scattered apically.
Male genitalia (Fig. 2A)**.** Relatively simple. Uncus as short as one half of aedeagus, rather convex on median part. Juxta straight, rather sclerotized with finger shape projection on basal part. Vinculum v-shape, as long as juxta. Saccus very short, rounded at base part. Valva straight, sclerotized, apex rounded with short hairs. Aedeagus as long as valva, almost straight, towards apex sclerotized.
Female genitalia. Abdomen missing.
Distribution. Korea (new record), Japan.
Host plants. *Pueraria montana* (Lour.) Merr. var. *lobata* (Willd.) Sanjappa & Pradeep [Fabaceae] in Japan (Kumata, 1963; De Prins and De Prins, 2006–2022).

Subfamily Ornixolinae Kuznetzov & Baryshnikova, 2001
Ornixolinae Kuznetzov & Baryshnikova, 2001: 99.
Type genus: *Ornixola* Kuznetzov, 1979.

Genus *Conopomorpha* Meyrick, 1885
Conopomorpha Meyrick, 1885: 592.
Type species: *Conopomorpha cyanospila* Meyrick, 1885.

Diagnosis. The genus is distinguished from other genera by its comparatively broad wings, which are nearly three times long as its width, male genitalia with uncus conical, gnathos absent, and saccus triangular pyramid-like, and female gen-

Korean name: [1]*작은오목가는나방 (신칭)

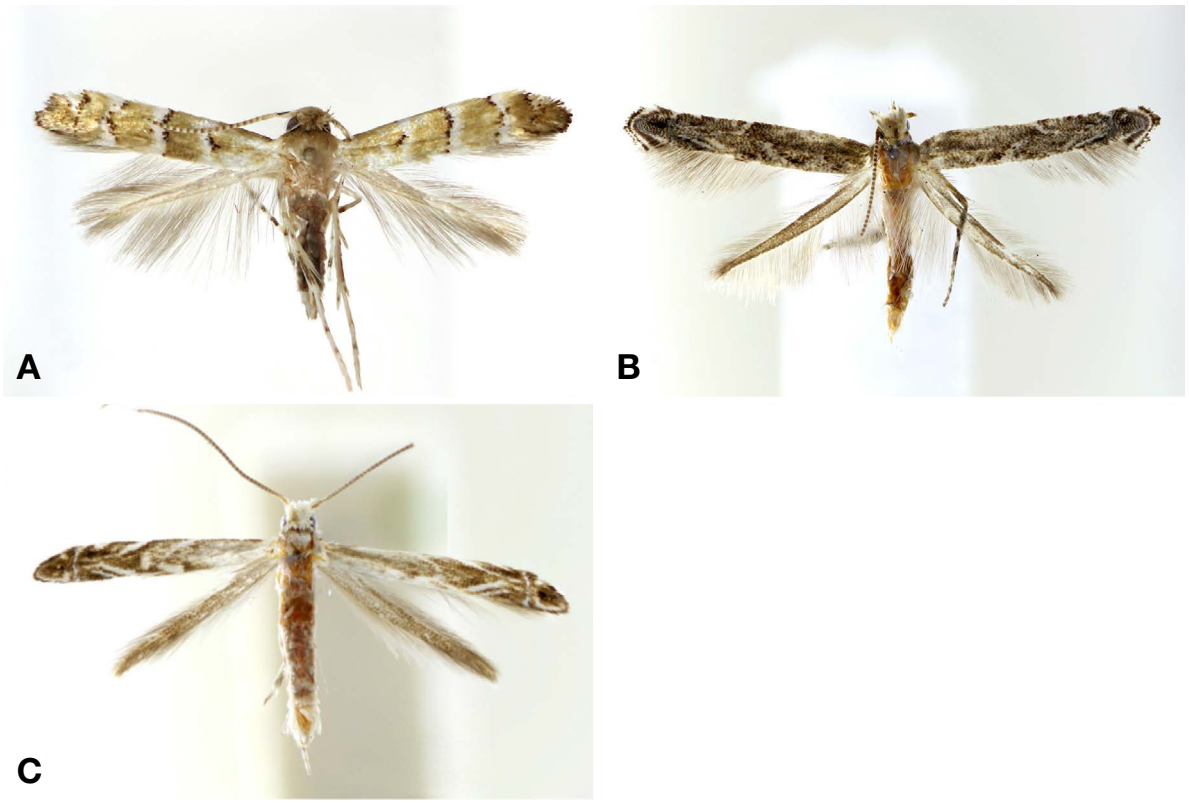

Fig. 1. A–C, Adults of Lithocolletinae and Ornixolinae. A, *Neolithocolletis hikomonticola* (gen. slide no. HNUSEL-5645); B, *Conopomorpha flueggella* (gen. slide no. HNUSEL-5522); C, *Epicephala nudilingua* (gen. slide no. HNUSEL-5519).

italia with antrum at middle part of the eighth and seventh sternum and short ductus bursa.

Distribution. Afrotropical, Australasian, Oriental, and Palearctic regions.

Remarks. 13 species from the genus *Conopomorpha* have been reported worldwide. In addition, our study reports this genus and a species under this genus for the first time from Korea.

[1]***Conopomorpha flueggella* Li, 2011**
(Figs. 1B, 2B, 2D, 2Da)

Conopomorpha flueggella Li, 2011: 46–50. TL: Tianjin, China. TD: coll. Hu (Holotype; Paratypes).

Material examined. 4 males, Korea: GW: Hoengseong-gun, 9 Aug 2018, leg. YS Bae, DJ Lee, TG Lee, YB Cha, gen. slide no. HNUSEL-5523,5526-coll. INU; Chuncheon, 30 Jul 1986, leg. KT Park, gen. slide no. HNUSEL-5522; Chuncheon, 28 May 1990, leg. KT Park, gen. slide no. HNUSEL-5387-coll. KNAE; 1 male; GG: Gapyeong, 23 Oct 2008, leg. BW Lee, SY Park, SR Kim, gen. slide no. HNUSEL-5374-coll. KNAE; 3 males, Mt. Taehwasan, 12 Aug 2018, leg. YS Bae, DJ Lee, TG Lee, YB Cha, gen. slide no. HNUSEL-5524-coll. INU; Sangnim-ri, 11 Aug 2018, leg. BK Byun, gen. slide no. HNUSEL-5569-coll. HNUSEL; Mt. Sudeoksan, 23 Oct 2008, leg. BW Lee, SY Park, SR Kim, gen. slide. no. HNUSEL-5375-coll. KNAE.

Redescription. Adult (Fig. 1B). Wingspan 10–11 mm. Head pale ochreous with tiny light gray spot and frons smooth; maxillary and labial palpus white with fuscous laterally and rough; antenna dark gray and base of each segment white; scape white mixed with gray. Thorax gray mixed with tiny white spot; legs fuscous with tiny white and ochreous scales; fore coxa with white on basal and apical part; fore femur and tibia fuscous; fore tarsus with narrow white band apically; middle femur white with fuscous scales on apex; middle tibia fuscous and rough scale; middle tarsus ochreous; hind femur yellowish white with fuscous spots on basal part; hind tibia white and fuscous apically; hind tarsus white and more yellowish apically.

Forewing ground color gray fuscous mixed with tiny white scales; base to half of forewing more whitish than other

Korean name: [1]*교차무늬가는나방 (신칭)

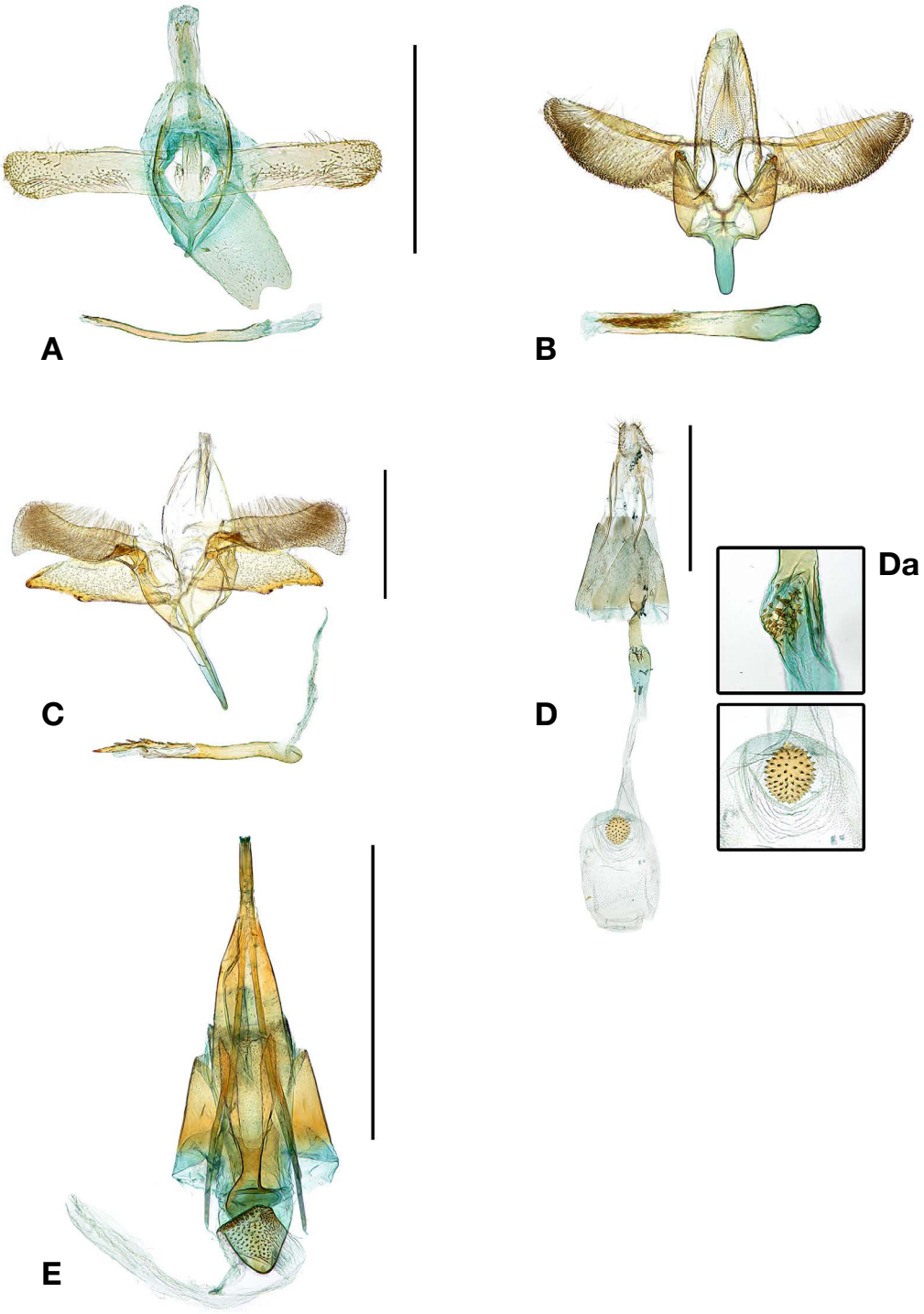

Fig. 2. A–E, Genitalia of Lithocolletinae and Ornixolinae. A, *Neolithocolletis hikomonticola* (gen. slide no. HNUSEL-5645); B, *Conomorpha flueggella* (gen. slide no. HNUSEL-5523); C, *Epicephala nudilingua* (gen. slide no. HNUSEL-5519); D, *Conopomorpha flueggella* (gen. slide no. HNUSEL-5569); Da, ditto signa; E, *Epicephala nudilingua* (gen. slide no. HNUSEL-5525). Scale bars: A–E = 0.5 mm.

areas; one white stria beginning on dorsal margin at a half of the forewing and stretched obliquely to outward; one white costa-stria on two thirds of forewing obliquely outward to an apex and narrowed to apically; two short striae near tornus side by side each other; one blackish spot on apex. Hindwing gray to ochreous and cilia long.

Male genitalia (Fig. 2B)**.** Tegumen as long as valva or slightly shorter, slender, narrowed to apex and apex rounded; both sides sclerotized with long setae and inner surface covered with one minute and acute spinules. Valva expanded vertically with tegumen, costal margin straight to apex, hind margin slightly concaved on base, swollen at median part, narrowed to apex and apex rounded and blunt; long setae on inner surface and more short and stout setae along ventral margin on apex to basal part. Vinculum wide and rectangular; saccus as long as one third of valva, parallel side to apex and apex slightly rectangular. Aedeagus longer than valva, slender and swollen at base; vesica with one blunt of cornuti on apex.

Female genitalia (Fig. 2D, Da)**.** Papillae anales short and reduced; apophyses posteriores slender and narrow and as long as two thirds of anteriores. Ostium bursae opening sized same with width of ductus bursae; antrum well sclerotized and elongated. Ductus bursae sclerotized on half caudally and one blunt of spinules on just below sclerotized area. Corpus bursae as long as ductus bursae and membranous; one signum sphere form covered with many projections.

Distribution. Korea (new record), China.

Host plants. *Flueggea suffruticosa* (Pall.) Baill. [Euphorbiaceae] in China (Hu et al., 2011; Prins and Prins, 2016–2022).

Genus *Epicephala* Meyrick, 1880

Epicephala Meyrick, 1880: 137, 168. Type species: *Epicephala colymbetella* Meyrick, 1880.

Iraina Diakonoff, 1955.

Leiocephala Kuznetzov & Baryshnikova, 2001.

Diagnosis. The genus is distinguished from other genera by comparatively elongated ovipositor of female genitalia.

Distribution. Afrotropical, Australasian, Oriental, and Palearctic regions.

Remarks. *Epicephala* moths are involved in obligate mutualisms with their Phyllanthaceae hosts, and the female moths pollinate the host plants. 75 species belonging to the genus *Epicephala* have been recorded globally. In this study, one species is recorded for the first time from Korea.

[1]**Epicephala nudilingua* Kawakita & Kato, 2016 (Figs. 1C, 2C, 2E)

Epicephala nudilingua Kawakita & Kato, 2016: 111–113. TL: Japan. TD: KYO (Holotype).

Material examined. 1 male, Korea, GG: Mt. Myeongjisan, 6 Aug 1999, leg. SH Lee, gen. slide no. 5519-coll. NAIST; 1 male, GW: Mt. Taegisan, 5 Jun 2018, leg. TG Lee, HK Kim, CM Jang, gen. slide no. 5525-coll. INU.

Redescription. Adult (Fig. 1C). Wingspan 8.3–8.8 mm. Coloration fuscous to ochreous depending on specimen. Head white tinge with pale ochreous or fuscous, one tuft of erected on the basal part, and frons and head smooth; maxillary palpus dark gray or pale ochreous dorsally; labial palpus ochreous, median dark gray and apical white; antenna dark grayish brown. Thorax white with gray; legs fuscous to pale ochreous; fore coxa fuscous except for white basal and ochreous median part; fore femur, tibia and tarsus entirely fuscous or pale ochreous; middle femur fuscous to ochreous; middle tibia with one blackish band on subbasal and apical on fuscous specimen.

Forewing ground color fuscous to ochreous with white stria; white striae start at opposite directions on costal margin and dorsal margin, respectively; one white streak along the dorso-basal margin to one third of forewing; first costal-white stria stretched obliquely to near wing fold; first dorsal marginal white stria more shorter than costal-white; second costal-white stria starts at two thirds of the forewing, elongated, smoothly bent and narrowed toward apex; one narrow and short white stria near one silvery longitudinal line; two dorsal marginal white stria under the second costal-white stria side by side; apex with one large blackish spot with obscure edges. Hindwing gray.

Male genitalia (Fig. 2C)**.** Tegumen elongated as long as valva, ovate and narrowed to apex. Valva narrow and slender, broadened to apex, hammer-shaped and basal folded; outer margin of apex more extended to downward; long setae densely on inner surface, more sparsely marginally; sacculus slightly shorter than valva, broaden to basal part, narrowed to apex, costal margin curved outward, outer margin straight basal to median part and concaved at rest part with rough margin. Vinculum more large than the tegumen in width and smoothly narrowed to saccus; saccus extremely narrowed to apex and elongated as long as two thirds of the valva. Aedeagus slender and narrow and apex acute with cornuti along lateral margin to middle.

Female genitalia (Fig. 2E)**.** Lamella postvaginalis deeply bilobed and each lobe rabbit ear-shaped as long as 7th sternite; ovipositor slightly blunt; apophyses posteriores two times longer than anteriores. Ostium bursae moderate in opening size as broad as basal of lamella postvaginalis; antrum highly sclerotized. Ductus bursae turned upside and curved back to downside; basal with minute spinules and membranous to corpus bursae. Corpus bursae ovate and weak.

Distribution. Korea (new record), Japan.

Host plants. *Phyllanthus ussuriensis* Rupr. & Maxim. [Euphorbiaceae] in Japan (Kawakita and Kato, 2016; Prins and Prins, 2016–2022).

Korean name: [1]*여우주머니가는나방 (신칭)

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CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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