

Taxonomic Review of the Genus *Thyas* Hübner (Lepidoptera: Noctuoidea: Erebidae) from Korea, Including the First Description of *T. coronata*

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한국산 *Thyas*속 (나비목: 태극나방과)의 분류학적 정리와 *T. coronata*의 첫 분류기재문 보고

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ABSTRACT: In this study, the Korean *Thyas* has been reviewed. We firstly described a species, *Thyas coronata* (Fabricius, 1775), including detailed illustrations of adult specimens and their reproductive organs. Additionally, we have provided taxonomic diagnoses and distributional information for all Korean *Thyas* species.

Key words: Korea, Lepidoptera, New record, Taxonomy, *Thyas*

초록: 본 연구를 통해 한국산 *Thyas*속을 검토하였다. 이 중, *T. coronata* (Fabricius, 1775)는 성충 및 생식기 도해사진을 기반으로 최초로 그 분류학적 기재문을 작성하였다. 모든 한국산 *Thyas*속 종에 대한 분류학적 진단형질 및 분포 정보를 함께 제공하였다.

검색어: *Thyas*, 나비목, 한국, 미기록, 태극나방과

Thyas, a little known genus established by Hübner in 1824, comprises 16 species worldwide and belongs to the tribe Ophiini of the subfamily Erebininae in the family Erebidae (Holloway, 2005). Members of the *Thyas* have primarily distributed from Afrotropical, Oriental, Australasian and Palearctic regions (Holloway, 2005). In biology, the larvae of *Thyas* have a broader host range including Lecythidaceae, Fagaceae, Juglandaceae, Combretaceae, Lauraceae, Menispermaceae, Pinaceae, Sapindaceae and so on (Robinson et al., 2001). The pupae lack a powdery bloom, and the adults are

often noted as fruit-borers such as *T. juno*, *T. coronata*, *T. honesta*, and *T. javanica* (Bänziger, 1982; Kuroko and Lewvanich, 1993).

So far, five species of *Thyas* have been mainly recorded from Oriental and Palearctic Asian regions: *T. honesta* and *T. juno* from Oriental and Palearctic; *T. javanica* only from Oriental; *T. miniacea* from Oriental and Australasian; *T. coronata* from Oriental, Palearctic, Australasian and Afrotropical (Holloway, 2005; Fukada, 2004; Yoshimoto, 2004). Only one species, *T. juno*, has been recorded by Leech (1889) in Korea.

The purpose of this study is to review the Korean *Thyas* including the first description of *T. coronata*. Taxonomic diagnoses for all species and distribution data, along with illustrations of adults and genitalia were also provided.

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Material and Methods

The materials for this study, including slide vouchers, are deposited in a single institute for preservation.: Lab. Of Insect Phylogenetics & Evolution. Jeonbuk National University (IPE JBNU), Republic of Korea.

The procedure of genitalia preparations for vouchers was conducted according to Kononenko and Han (2007). All dried specimens were examined under a Nikon Z6 Mirrorless camera (Nikon Corporation, Japan), Canon EOS 6D DSLR camera (Canon Inc., Japan) and a Leica MSV 266 microscope (Leica Micro systems, Germany). And digital images were taken using Adobe Photoshop Lightroom software (Adobe Systems Incorporated, USA), Helicon Focus & Helicon Remote (Heliconsoft, Ukraine), Mosaic v2.3 (Tucsen, China) and DeltaBio MultiFocus v.23 (DeltaBio, Korea).

Results

Genus *Thyas* Hübner, 1824

Thyas Hübner, 1824; Samml. Exot. Schmeel. 2: 203. Type species. *Thyas honesta* Hübner, [1824]. Type Locality: Not stated.

Diagnosis. This genus is characterized by yellow or black reniform markings on the forewing, yellow or red scales on the hindwing, and black or brown bands or spots on the abdomen. In the larval morphology, the *Thyas* is differentiated by the circular spot of variegated black within the dorsal ellipse on the abdominal 5th segment.

Distribution. Palearctic, Oriental, Australasian and Afrotropical (Holloway, 2005; Kishida, 2011; Kononenko et al., 1998).

Remark. There are two other species, *T. honesta*, and *T. javanica*, that are expected to have the potential to be found in Korea, as they have been discovered in the East Asia region.

Thyas coronata (Fabricius, 1775)

Noctua coronata Fabricius, 1775: 596. Type locality. China.

Noctua leonina Fabricius, 1775: 596; Type locality. India.

Noctua ancilla Fabricius, 1794: 17; Type locality. India Orientali.

Corycia magica Hübner, 1831: 3, p.32, pl.93, f.535, 536;

TL: Monte Video [error].

Ophiodes ponderosa Mabille, 1880: 9: 346; TL: Madagascar.

Diagnosis. This species (Fig. 1) is similar to *T. juno* (Fig. 2) in forewing pattern when the wings are folded, but can be easily distinguished by the distinct and fuscous reniform marking on the forewing.

Description. Male (Fig. 1). Head: Frons reddish brown; vertex brown. Scape of antenna brown and short; flagellum with apical part of dark orange scale and basal part of brownish orange. Labial palpus with brown and especially furry second segment, dark brown third segment with less scale and coiled proboscis dark green. Thorax: Thorax and tegula light brown dorsally, bright gold ventrally. Wingspan 77.0-80.0 mm. Forewing ground color reddish brown. Four liners: one near base, short; antemedial oblique one, gradually round toward to 1/3 posterior margin; postmedial one bent inward to 1/2 posterior margin; sub-terminal one oblique to outer margin of forewing. Two distinct markings: orbicular small and light gray; reniform big and black. Ventral side of forewing with dark caramelly moved from outer margin its warm wood shade, dark brown speckles between M2 and Cu1 in subterminal field. Hindwing light orange ground color with black thick medial and terminal fuscous bands; ventral side similar forewing. Abdomen orange with black segments; basal part orange. Legs: All tibia spined shape, hindleg with hairy femur and tibia.

Male genitalia (Fig. 3). Uncus curved shape in the form of a bird's beak with a pointed apex, bent at the basal 1/3, covered with dense setose after half to apex (Fig. 3C). Scaphium up-turned shape in the middle, about 1/3 the size of the uncus (Fig. 3C). Tegumen straight, asymmetric: left side curved; right side straight (Fig. 3C). Valva large, rounded, s-shaped body with a hairy tip (Fig. 3A). Sacculus wide, paddle shaped. Harpe hook shaped from the bilateral sacculus (Fig. 3E). Hair pencil long with rounded ends; from both sacculus, not sclerotized (Fig. 3A). Aedeagus curved shape with an extended coecum (Fig. 3D). Carina with two slightly raised peaks and broad at the end (Fig. 3D). Vesica with many little patches; two diverticula and one spine (Fig. 3D).

Material examined. 2 ♂, Korea, Jeollanam-do, Wando-gun, Wando-eup, Jangjwa-ri, 26-28 VII 2022 (S. Kim et al.), gen. slide no. IPE 15006 / Hee Han.

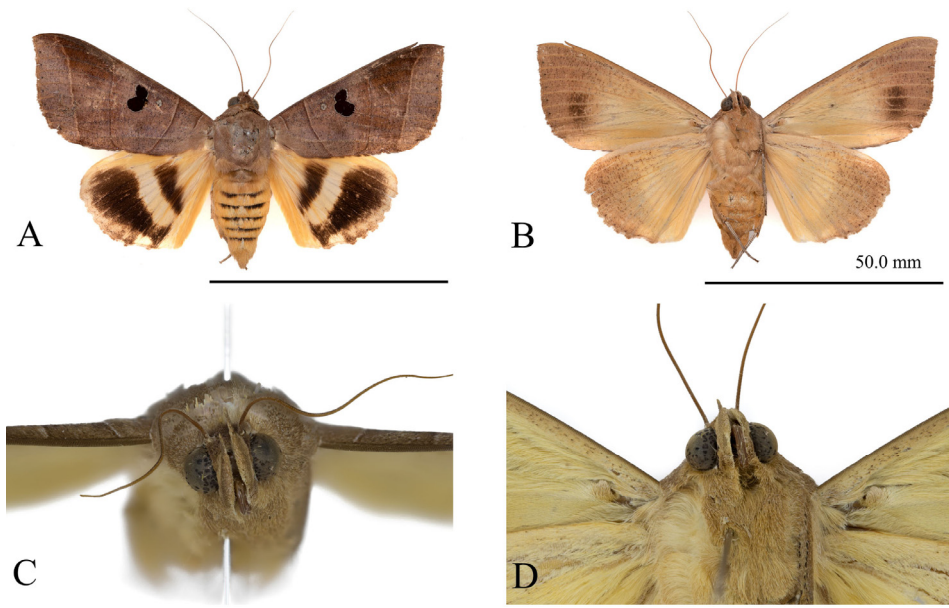


Fig. 1. Adult of *Thyas coronata* (Fabricius, 1775) from Wando: A-D, Male; A, habitus in dorsal; B, ventral view; C-D, Head; C, Front view; D, ventral view. Scale bar: 50.0 mm.

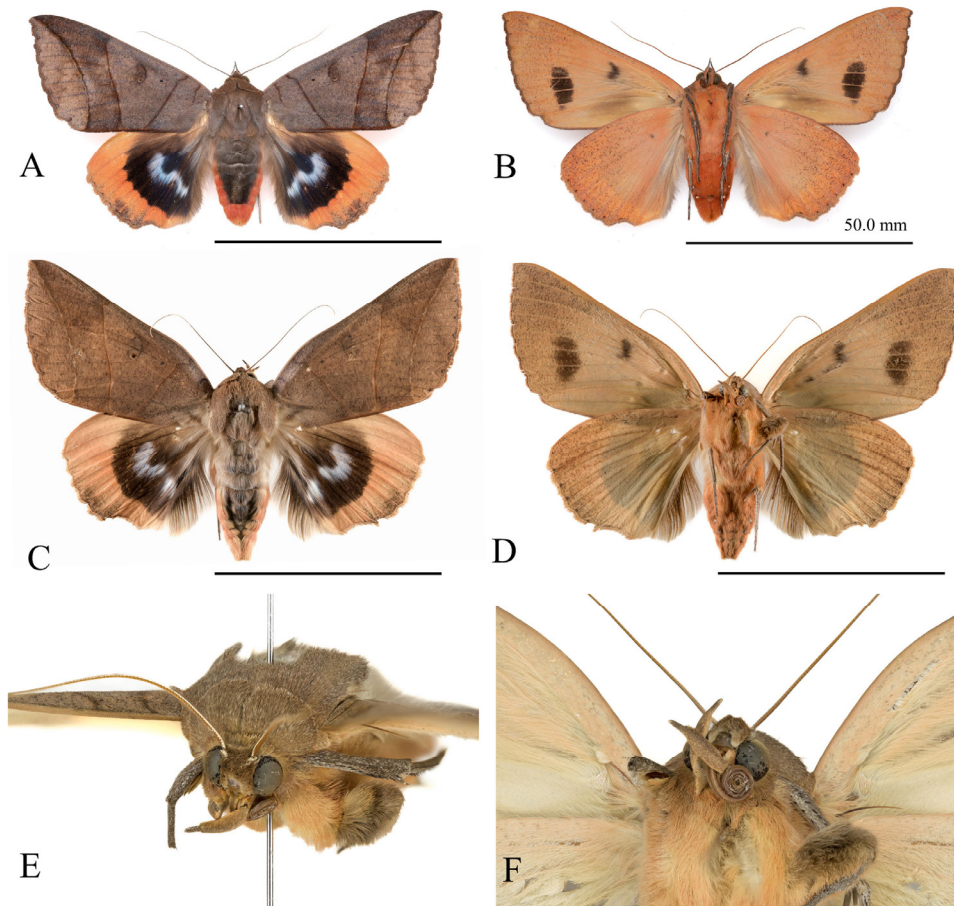


Fig. 2. Adult of *Thyas juno* (Dalman, 1823); A-B, Female; A, habitus in dorsal; B, ventral view; C-F, Male; C, habitus in dorsal; D, ventral view; E-F, Head; E, Front view; F, ventral view. Scale bar: 50.0 mm.

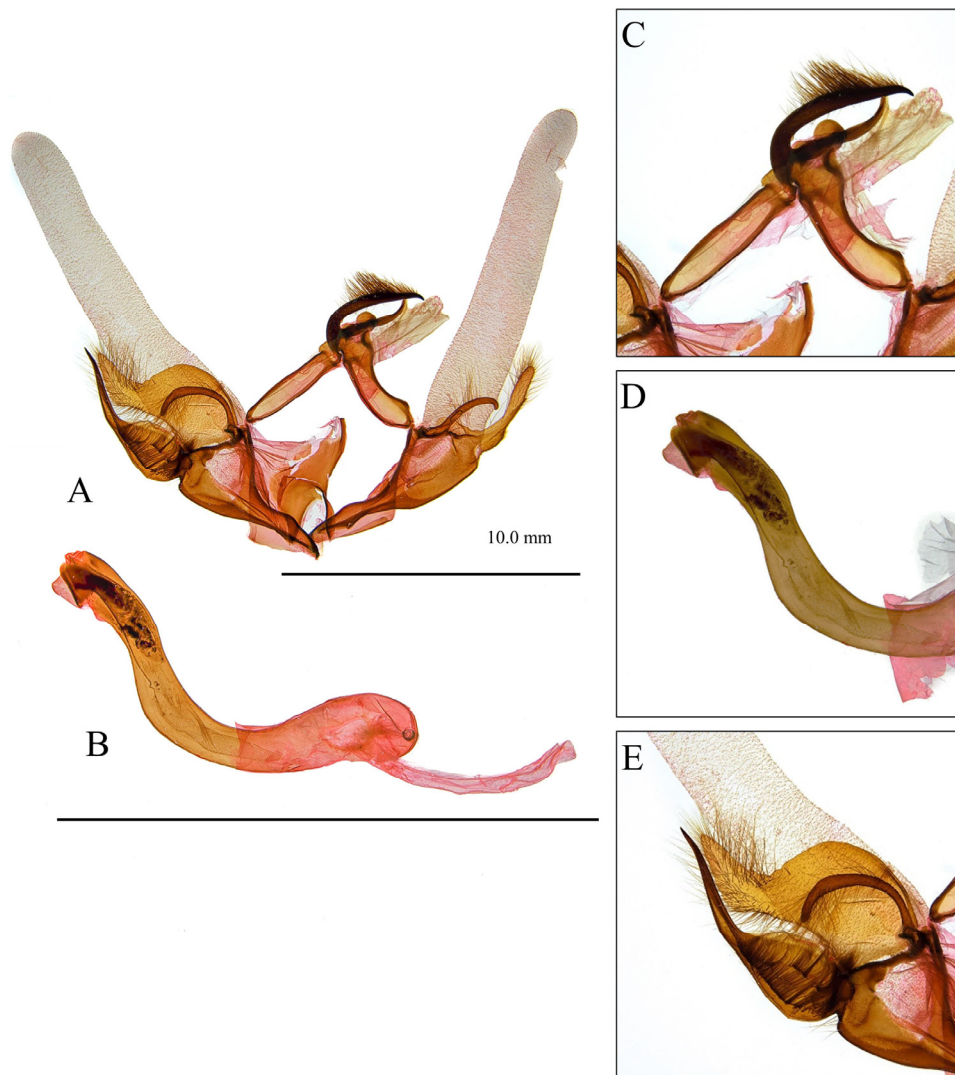


Fig. 3. Genitalia of *T. coronata*, male: A-E; A, male genitalia; B, aedeagus; C, uncus, tegumen, scaphium; D, carina, vesica; E, sacculus process in right valva. Scale bar: 10.0mm.

Distribution. Palaearctic: Korea (new record; this study), China, Japan; Oriental: Taiwan, India, Nepal, Sri Lanka; Australasian: Australia, Micronesia; Afrotropical: South Africa, Madagascar (Fabricius, 1775; Hübner, 1824; Holloway, 2005; Mabille, 1880).

***Thyas juno* (Dalman, 1823)**

Noctua juno Dalman, 1823: 52. Type locality. Not Stated.

Ophideres elegans Van der Hoeven, 1840: 280. Type locality. Java.

Lagoptera multicolor Guenée, 1852: 226. Type locality. Java.

Thyas bella Bremer and Grey, 1853a: 66. Type locality. Not

Stated.

Thyas bella Bremer and Grey, 1853b: 18. Type locality. Not Stated.

Dermalepia juno ceramensis Prout, 1922: 224. Type locality. Central Ceram, Manusela.

Dermalepia juno f. *renalis* Bryk, 1948: 120. Type locality. Korea.

Diagnosis. This species (Fig. 2) is similar to *T. coronata* (Fig. 1) in forewing pattern when the wings are folded, but can be easily distinguished by the fact that the postmedial and antemedial lines extend vertically near the ventral margin. In

addition, its abdomen has yellowish dark brown scales on the 7th segment, and the hindwing has yellowish orange ground color without terminal marking and a black basal angle with a bluish white marking within it.

Redescription. Adult (Fig. 2). Head: Frons reddish brown; vertex brown. Scape of antenna brown and short; flagellum with apical part of dark orange scale and basal part of brownish orange. Labial palpus with brown and especially furry second segment, dark brown third segment with less scale and coiled proboscis dark green. Thorax: Thorax and tegula light brown dorsally, bright gold ventrally. Wingspan 77.0-90.0 mm. Forewing ground color light brown. Four liners: one near base, short; antemedial oblique one, straight but with a single curve towards the body near the costal margin; postmedial one

straight and parallel to the outer margin; sub-terminal one oblique to outer margin of forewing. Two distinct markings: orbicular very small, black; reniform big and black or faded. Ventral side of forewing uniform yellow color, with large black spot between M2 and Cu1 in subterminal field and small black spot inside cell M. Hindwing yellowish orange ground color with black basal angle with a bluish white marking within it; ventral side similar forewing. Abdomen orange ground color with dark brown scales on the 1st segment through the 7th segment; basal part orange.

Male genitalia (Fig. 4A-B). Uncus long, with a tuft of hairs a little above the base, bent once at the 1/3rd point, with a pointed spine at the tip. Tegumen symmetrical, with finger-like protrusions on each side. Valva large and complex; Costa

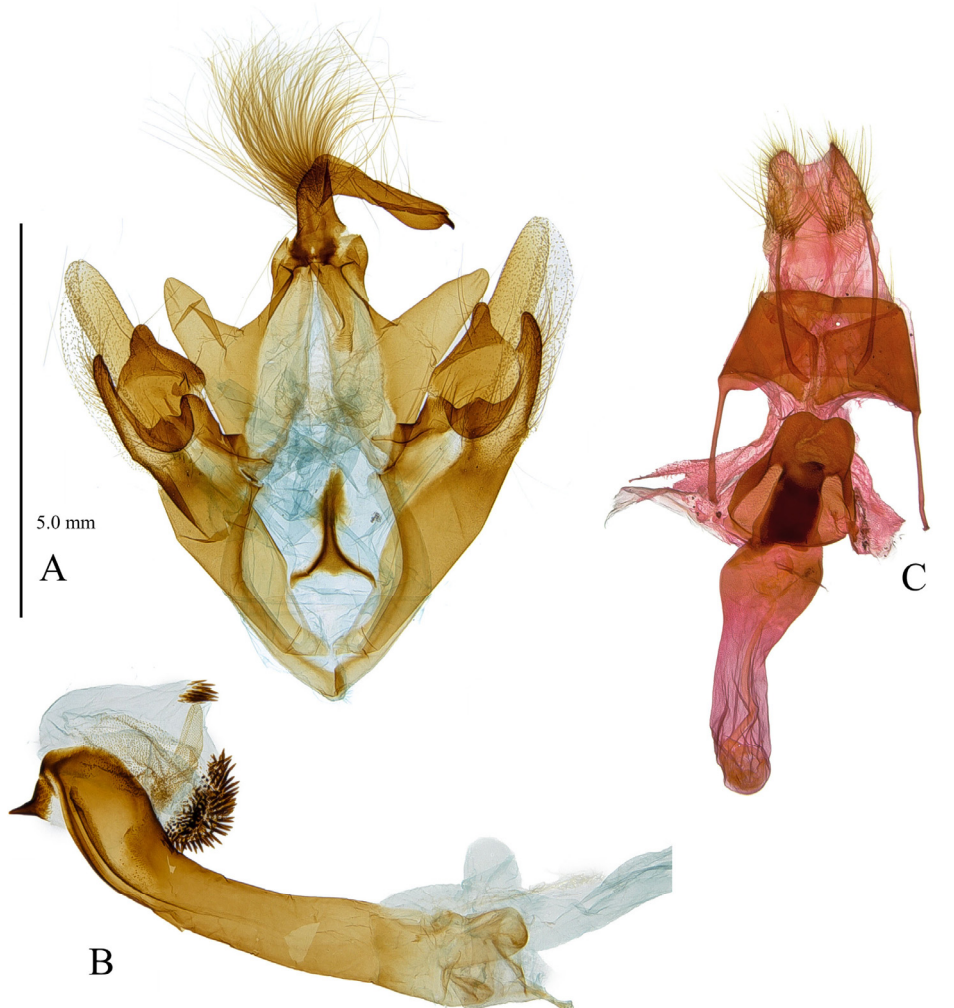


Fig. 4. Genitalia of *T. juno*, male: A-B; A, male genitalia; B, aedeagus; female: C. Scale bar: 5.0 mm.

elongated posteriorly, divided into a sclerotized inner part and a membranous outer part; Harpe horny from outside, with a rounded process containing a protuberance above it. Sacculus gradually narrowing and descending. Vinculum elliptical. Juxta thin, inverted Y-shaped, with tufts of hairs on top. Aedeagus slightly curved in the middle. Vesica bulbous, with one cornutus at the bottom, a few spines at the top, and many spines in the middle.

Female genitalia (Fig. 4C). Papilla anales with setae. Apophyses posteriors and anterioris slender, similar in length. Antrum flattened, funnel-shaped, sclerotised. Ductus bursae short. Corpus bursae membranous and about three times as long as ductus bursae; no superficial features.

Material examined. 7♂, 10♀: 2♂, Gangwon-do, Wonju-si, Socho-myeon, Gyohyang-ri, 5 VII 2023 (H. Han et al.); 5♀, same locality, date and collector; 1♀, Gangwon-do, Honcheong-gun, Yeonggwimi-myeon, Sinbong-ri, 6 VII 2023 (H. Han et al.); 1♀, Gyeongsangbuk-do, Uljin-gun, Maehwa-myeon, Gilgok-ri, 26 VII 2023 (H. Han et al.); 2♀, Jeollabuk-do, Jangsu-gun, Janggye-myeon, Daegok-ri, 14 VIII 2022 (H. Han and J. S. Kim), gen. slide no. IPE 15005, 15007 / Hee Han; 1♀, Jeollanam-do, Gangjin-gun, Doam-myeon, Bonghwang-ri, 6 VII 2023 (Y. B. Cha et al.); 1♂, Jeollanam-do, Wando-gun, Guneo-meyon, Dangjin-ri, 28 VI 2022 (S. Kim et al.); 1♀, Jeollanam-do, Wando-gun, Wando-eup, Jangjwa-ri, 27 VII 2022 (S. Kim et al.), gen. slide no. IPE 15002 / Hee Han; 4♂, Jeollanam-do, Wando-gun, Gunoe-myeon, Samdu-ri, 10 VII 2023 (Y. B. Cha et al.), gen. slide no. IPE 15009; 2♀, same locality, date and collector.

Distribution. Palaearctic: Korea, China, Japan, Russia; Oriental: Taiwan, Philippines, Indonesia, Malaysia, Indochina, India, Nepal (Holloway, 2005; Kishida, 2011; Kononenko et al., 1998).

Remark. Males have a swollen forewing basal part, and long hairs develop on the ventral margin of the hindwing (Fig. 2C).

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Statements for Authorship Position & Contribution

Han, H.: Jeonbuk National University, Graduate Student; wrote the manuscript, morphological identifications, prepared genitalia vouchers and figures
Bayarsaikhan, U.: Incheon National University, Research Professor; Editing
Kim, S.: Jeonbuk National University, Professor; Designed the research, editing, revising, finance support

All authors read and approved the manuscript.

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