

First Record of the Family Ciidae (Coleoptera: Tenebrionoidea), from Korea, with two Unrecorded Species of *Octotemnus* Mellié on Fungi

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한국산 미기록과 애기버섯벌레과(딱정벌레목: 거저리상과)에 속한 *Octotemnus* Mellié 2 미기록종과 숙주버섯

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ABSTRACT: The family Ciidae is presented for the first time from Korea. Two unrecorded species, *Octotemnus laminifrons* (Motschulsky) and *Octotemnus japonicus* Miyatake are reported. Morphological photographs of adults, description, illustrations of diagnostic characteristics, and host fungi are provided.

Key words: *Octotemnus laminifrons* (Motschulsky), *Octotemnus japonicus* Miyatake, taxonomy, host fungi, new record.

초 록: 한국산 미기록과 애기버섯벌레과(Ciidae, Leach)(신칭)에 속한 *Octotemnus* Mellié(딱정벌레목: 거저리상과)(신칭)의 분류학적 연구를 수행하였다. 이 속에 속한 *Octotemnus laminifrons* (Motschulsky)(떡애기버섯벌레)(신칭)와 *Octotemnus japonicus* Miyatake(일본떡애기버섯벌레)(신칭) 등 2종을 국내에서 처음으로 분류학적으로 검토하고 야외관찰과 실내사육을 통해 숙주버섯을 밝혔다. 각 종에 대한 검색키, 기재문, 진단형질 그림, 성충사진과 숙주버섯을 제공하였다.

검색어: 애기버섯벌레과(Ciidae), 떡애기버섯벌레[*Octotemnus laminifrons* (Motschulsky)], 일본떡애기버섯벌레 (*Octotemnus japonicus* Miyatake), 미기록과, 미기록종, 분류, 숙주버섯

The beetle family Ciidae Leach is a relatively moderate family, which comprises about 640 described species in 42 genera worldwide (Abdullah, 1973; Thayer and Lawrence, 2002; Jelínek, 2008; Buder *et al.*, 2008) This family is distributed throughout the world (Abdullah, 1973; Jelínek, 2008; Buder *et al.*, 2008).

This family is characterized by the following features: minute to small, usually less than between 0.5 and 7.0 mm long; body convex, usually oval or elongate beetles; antennae with 8-10 antennomeres, apical 2 or 3 forming a club; 4-4-4 tarsal formula; procoxal cavities open internally. The males are often provided with various kinds

of cephalic and thoracic armature like horns, tubercles, and plates (Thayer and Lawrence, 2002).

Ciids, the minute fungus-feeding beetles, are associated with the mycelia and fruiting bodies of wood-rotting fungi (Lawrence 1971; Orledge and Reynolds, 2005). These beetles are considered mycetobiont because they depend upon the basidiocarps for food and breeding throughout their life span (Scheerpeltz and Höfler, 1948; Gumier-Costa *et al.*, 2003). They are also important components of the saproxylic fauna of many forests ecosystems (Pielou and Verma 1968; Matthewman and Pielou 1971; Christopher, 2007). A number of species are associated with old growth forests or undisturbed forest conditions and are considered rare or threatened species (Siitonen and Martikainen, 1994; Siitonen *et al.*, 1996; Lopes-Andrade 2007; Christopher, 2007).

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In this paper, the family Ciidae is reported, as representative species by *Octotemnus laminifrons* (Motschulsky, 1860) and *Octotemnus japonicus* Miyatake, 1954 for the first time in Korea. The relationship between Korean ciids and its host fungi- and ecological information regarding their habitat- are studied, based on reared specimens in the laboratory and field observations. Description, photos of adults, fungal hosts, and illustrations of diagnostic characteristics are provided.

Samples were collected from host fungi growing on dead or decaying trees from 2005 to 2009 and reared in the laboratory. In this study, the following 5 stages of maturation of the fruiting body were recognized: 1) stage I means the first appearance of the young, growing fruiting body; 2) stage II means the old fruiting body between the maturation of the spores and dissemination of ripe spore; 3) stage III means the beginning of tissue breakdown in the conk; 4) stage IV means the rapidly decaying stage of the fruiting body; 5) stage V means mounting stage (Grave, 1960; Klimaszewski and Peck, 1987). These specimens were preserved in 70% ethanol, dry-mounted and deposited in the Jung's Insect Collection (Seoul, Korea). The following abbreviations were used to indicate the provinces in which the various specimens were collected: GW; Gangweon-do, GG: Gyeonggi-do, S: Seoul, CB: Chungcheongbuk-do, CN: Chungcheongnam-do, JB; Jeollabuk-do, GB: Gyeongsangbuk-do.

Systematic accounts

Family Ciidae Leach 애기버섯벌레과(신칭)

Cisidae Leach, 1819: 206.

Ciidae Schilsky, 1901: 38.

Genus *Octotemnus* Mellié

Octotemnus Mellié, 1847: 108 (type species: *Cis glabriculus* Gyllenhal, 1872).

Orophius Redtenbacher, 1847: 250 (type species: *Cis mandibularis* Gyllenhal, 1813).

Orophys Kiesenwetter, 1877: 195 [incorrect subsequent spelling].

Cis: Gyllenhal, 1813: 717 [partim].

Diagnosis. Body oblong to elongate, cylindrical, strongly convex, glossy on dorsally, with short or very short fine hairs; frons simple or with two large setiferous tubercles in male; mandibles sometimes enlarged; Antenna with 8 antennomeres, apical 3 antennomeres forming a loose club; apical antennomere bearing four sensillifers, of which one is situated at apex (Fig. 5). All tibiae with spines along the outer margins (Fig. 6). Abdominal sternite with bill-shaped fovea in male (Fig. 7) (Lawrence, 1974; Kawanabe, 2002).

Remarks. The genus *Octotemnus* belonging to the tribe Orophini is a relatively small group including 21 species, and is mainly distributed throughout Palaearctic and Indo-Pacific regions except for one species, *O. laevis* Casey, which occurs in the Nearctic region (Kawanabe, 2002). As for the Korean species, their host fungi are usually *Lenzites beulina* (L.: Fr.) Fr., *Coriolus versicolor* (L.: Fr.) Quél. and its related species, thus they prefer the fungi species with ligneous and thin fruiting body (pers. com. by Jung).

Key to the species of Korean *Octotemnus*

- Mandibles of male, armed with large, and upturned process, forming horn-like projection; protibiae with ten or more spine-like teeth along outer margin
..... *O. laminifrons*
- Left mandible of male sometimes with sharply and strongly developed spine-like teeth on upper part; protibiae with 8 or less spine-like teeth on apical half
..... *O. japonicus*

Octotemnus laminifrons (Motschulsky) 턱애기버섯벌레 (신칭)

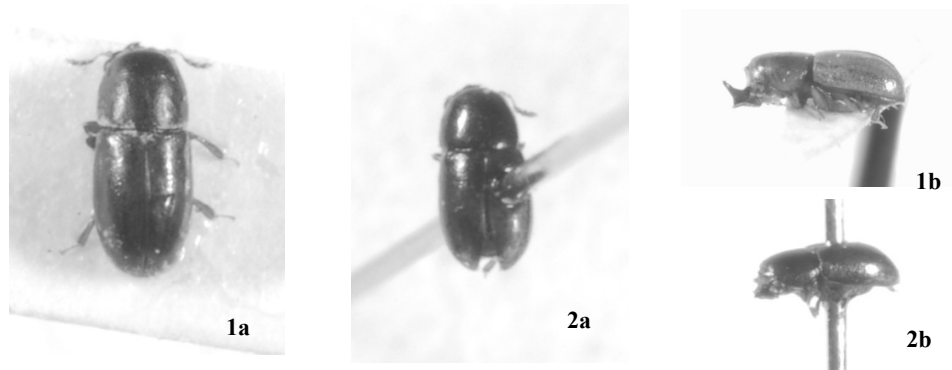
(Figs. 1a, 1b, 3)

Orophius laminifrons Motschulsky, 1860: 17.

Octotemnus laminifrons: Lawrence, 1971: 508.

Description.

Body length 1.3-1.9 mm. Body elongate, cylindrical,



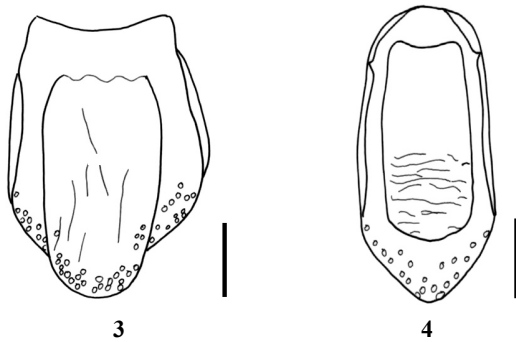
Figures 1a-2b. Habitus of *Octotemnus*. 1a. *Octotemnus laminifrons* (dorsal view); 1b. *Octotemnus laminifrons* (lateral view); 2a. *Octotemnus japonicus* (dorsal view); 2b. *Octotemnus japonicus* (lateral view).

parallel-sided, strongly convex, with tiny, shallow and sparse punctures; brownish black to black and strongly glossy; antennae, palpi and legs reddish brown. Head weakly reticulate, with tiny and shallow punctures; frons convex; anterior margin slightly arcuate from eye to clypeus on each side, slightly reflex and narrowly ridged; antennae clavate, apical 3 antennomeres forming a loose club; antennomere 3 about twice longer than antennomere 4; maxillary palpomere cylindrical. Pronotum weakly reticulate, with shallow and minute punctures; strongly convex; almost parallel-sided; anterior margin simply rounded; lateral margins narrowly marginated, rarely visible dorsally, while broadly marginated in lateral view; basal margin narrowly marginate, weakly sinuous. Elytra convex, almost parallel-sided; with irregular and shallow punctures, without strial puncture; lateral margins invisible dorsally. All tibiae strongly expanded externally; fore tibiae with ten or more spine-like teeth on outer margin.

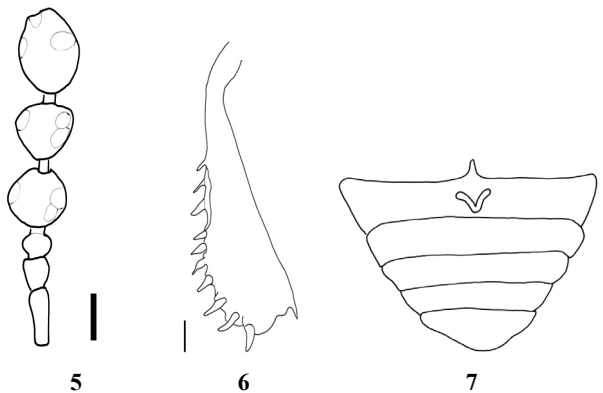
Male frons with two small processes on either side of middle part; mandibles large, with largely and strongly upturned process, forming horn-like projection; abdominal sternite 1 with pubescent fovea, partially covered with a bill-shaped process at middle part. Female frons sometimes slightly depressed at middle part; mandibles small, without upturned process, not forming horn-like projection; abdominal sternite 1 without pubescent fovea and bill-shaped process.

Specimens examined. <GW>: 2 ♀ 3 ♂ Sanghaga-ri, Hwaengseong-gun, 15 IV 2006, B.-H. Jung ex *Coriolus versicolor* (L.: Fr.) Quél. (successional stages III); 1 ♀

Temple Baekdam-sa, Mt. Seorak-san, Inje-gun, 25 VIII 2006, B.-H. Jung ex *Coriolus versicolor* (L.: Fr.) Quél. (successional stages III); <GG>: 3 ♀ Mt. Jungmi-san, Okcheon-myeon, Yangpyeong-gun, 29 I 2006, B.-H. Jung ex *Lenzites beulina* (L.: Fr.) Fr. (successional stages II); 1 ♀ Mt. Dodram-san, Icheon-gun, 29 II 2006, B.-H. Jung ex *Lenzites beulina* (L.: Fr.) Fr. (successional stages III); 2 ♂ Okhyeon-ri, Jije-myeon, Yangpyeong-gun, 14 V 2006, B.-H. Jung ex *Lenzites beulina* (L.: Fr.) Fr. (successional stages II); 1 ♀ Mt. Muga p-san, Toechon-myeon, Gwangju-gun, 28 V 2006, B.-H. Jung ex *Coriolus versicolor* (L.: Fr.) Quél. (successional stages III); 1 ♂ Okhyeon-ri, Jije-myeon, Yangpyeong-gun, 15 VI 2006, B.-H. Jung ex *Coriolus versicolor* (L.: Fr.) Quél. (successional stages III); 4 ♀ 2 ♂ Okhyeon-ri, Jije-myeon, Yangpyeong-gun, 5 V 2007, B.-H. Jung ex *Coriolus versicolor* (L.: Fr.) Quél. (successional stages III); <S>: 2 ♀ 1 ♂ 1 Ogeum Park, Ogeum-dong, Songpa-gu, Seoul-si, 4 IV 2006, B.-H. Jung ex *Inonotus* sp. (successional stages II); 4 ♀ 1 ♂ Gildong Natural Ecological Park, Gil-dong, Gandong-gu, Seoul-si, 2 V 2006, B.-H. Jung ex *Lenzites beulina* (L.: Fr.) Fr. (successional stages III); <CN>: 3 ♀ Mt. Mansu-san, Oesan-myeon, Buyeo-gun, 20 VI 2008, B.-H. Jung ex *Lenzites beulina* (L.: Fr.) Fr. (successional stages III); 3 ♀ 1 ♂ Mt. Mansu-san, Oesan-myeon, Buyeo-gun, 20 VI 2008, B.-H. Jung ex *Coriolus versicolor* (L.: Fr.) Quél. (successional stages III); <JB>: 4 ♂ Mt. Moak-san, Gimje-gun, 15 IV 2007, B.-H. Jung ex *Coriolus hirsutus* (Wulf. : Fr.) Quél. (successional stages III); <GB>: 1 ♀ 4 ♂ Mungyeong-si, 10 VI 2008, B.-H. Jung ex *Coriolus*



Figures 3-4. Aedeagus of Korean *Octotemnus*. (Each scale bar = 0.1mm). 3. *Octotemnus laminifrons*; 4. *Octotemnus japonicus*.



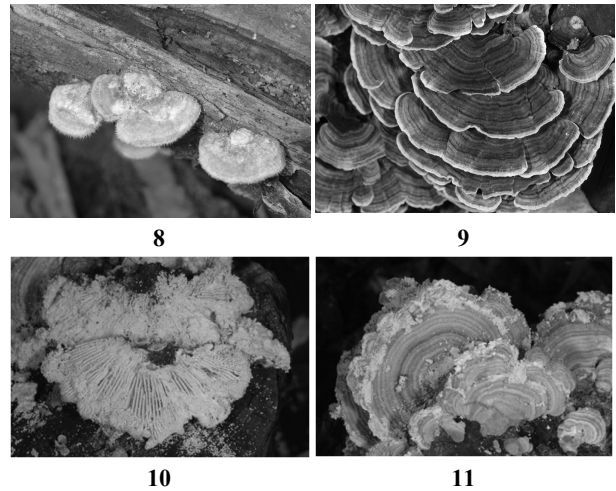
Figures 5-7. Specific characteristics of Korean *Octotemnus* (each scale bar = 1mm except for 7). 5. Antennae of *O. laminifrons*; 6. Right Foretibiae of *O. laminifrons* (dorsal view); 7. Male abdominal sternite of *O. laminifrons* (scale bar = 1mm).

versicolor (L.: Fr.) Quél. (successional stages III); 2♀2♂ Hosan-ri, Samcheok-si, 26 V 2006, B.-H. Jung ex *Coriolus versicolor* (L.: Fr.) Quél (successional stages III).

Distribution. Korea, Japan

Host fungi. *Coriolus versicolor* (L.: Fr.) Quél. (Fig. 9), *Coriolus hirsutus* (Wulf. : Fr.) Quél. (Fig. 8), *Lenzites beulina* (L.: Fr.) Fr., (Figs. 10, 11) and *Inonotus* sp.

Remarks. *Octotemnus laminifrons* (Motschulsky) is commonly distributed in Korea and a mycetobiont which is an obligatory fungal inhabitant. This species mostly inhabit in the fruiting bodies of Polyporaceae (e. g., *Coriolus*, *Lenzites*, etc), which are ligneous and longevous. Especially it feeds and collected in the successional stages III of host fungi, which the fruiting body begins to decay. Host fungi of this species is very thin because *O. laminifrons* is so



Figures 8-11. Host fungi of Korean *Octotemnus*. 8. *Coriolus hirsutus*; 9. *Coriolus versicolor*; 10. *Lenzites beulina* (gills); 11. *Lenzites beulina* (upper part).

minute enough to feed and breed in the thin fruiting body. This is also species found at the fungi associated with decaying trees which are distributed in the shaded area. Both adults and larvae usually feed and breed in the context of fruiting body all year around, forming a chamber. Adults often feed the hymenium which contains the spores, They overwinter as adults, larvae and pupae.

Octotemnus japonicus Miyatake 일본턱애기버섯벌레 (신칭)
(Figs. 2a, 2b, 4)

Octotemnus (*Orophius*) *japonicus* Miyatake, 1954: 64.
Octotemnus japonicus: Lawrence, 1971: 508.

Description.

Body length 1.2-1.4 mm. Body elongate, cylindrical, parallel-sided, strongly convex, brownish black to black and strongly glossy; antennae, palpi and legs reddish brown. Head weakly reticulate, with tiny and sparse punctures; frons convex; anterior margin slightly arcuate from eye to clypeus on each side, slightly reflex and narrowly ridged; antennae clavate, apical 3 antennomeres forming a loose club; antennomere 3 about 0.6 times longer than antennomere 4; maxillary palpomere cylindrical. Pronotum finely reticulate, with very tiny punctures; strongly convex; almost parallel-sided; anterior margin simply rounded; lateral margins narrowly marginated; basal margin narrowly

marginate, almost sinuous. Elytra convex; cylindrical; without striae puncture; with irregular and indistinct punctures. Anterior tibiae not strongly expanded on outer margin, with 8 or less spine-like teeth on apical half, teeth gradually large apically.

Male frons with two distinct triangular processes on either side of middle part; left mandible sometimes with sharply and strongly developed spine-like teeth on upper part; abdominal sternite 1 with pubescent fovea, partially covered with a bill-shaped process at middle part. *Female* frons sometimes slightly depressed at middle part; mandibles small, without horn-like tooth on upper part; abdominal sternite 1 without pubescent fovea and bill-shaped process.

Specimens examined. <GG>: 2 ♀ Mt. Wungil-san, Namyangju-si, 13 V 2006, B.-H. Jung *ex Lenzites beulina* (L.: Fr.) Fr. (successional stages III); 2 ♀ Mt. Mugap-san, Teochon-myeon, Gwangju-si, 13 V 2006, B.-H. Jung *ex Lenzites beulina* (L.: Fr.) Fr. (successional stages III); 1 ♀ 2 ♂ Donggureong, Guri-si, 10 X 2006, B.-H. Jung *ex Coriolus hirsutus* (Wulf.: Fr.) Quél. (successional stages IV); 4 ♀ 1 ♂ Mt. Seowun-san, Anseong-si, 21 XII 2006, B.-H. Jung *ex Daedaleopsis styracina* (P. Henn. et Shirai) Imaz. (successional stages III); 1 ♂ Okhyeon-ri, Jije-myeon, Yangpyeong-gun, 5 V 2007, B.-H. Jung *ex Coriolus versicolor* (L.: Fr.) Quél. (successional stages III).

Distribution. Korea, Japan.

Host fungi: *Lenzites beulina* (L.: Fr.) Fr., *Daedaleopsis styracina* (P. Henn. et Shirai) Imaz. and *Coriolus hirsutus* (Wulf.: Fr.) Quél.

Remarks. *Octotemnus japonicus* Miyatake is rarely founded in Korea. Other notes are same as those in the Remarks for *O. laminifrons*.

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