

Taxonomic Study on the Subfamily Agrypninae (Coleoptera: Elateridae) in Korea

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李承煥 · 禹建錫 · 李英仁 : 韓國產 녹슬은방아벌레亞科(딱정벌레目 : 방아벌레科)의 分類學的 研究

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ABSTRACT Studies were carried out with specimens collected throughout the country during 1984~1986, and preserved specimens kept in the Insect Museum within the Dept. of Agricultural Biology, College of Agriculture, Seoul Nat'l Univ., and the Dept. of Entomol., Institute of Agricultural Sciences, Suweon, Korea. As the result of this study, 10 species and 1 subspecies are presented here with a key and descriptions. Among them, 7 species and 1 subspecies are already reported by others, while the rest 3 species (*Agrypnus setigera*, *A. miyamotoi*, *A. hyponicola*) are reported here for the first time in Korea.

INTRODUCTION

Agrypninae is a subfamily under the family Elateridae, one of the large families with about 8,500 known species among Coleoptera. According to the literature survey in Korea, Candèze(1874) was the first one who described one species, *Agrypnus depressus*. Thereafter, one new species *Agrypnus herzi* was described by Koenig(1887) and five species and one subspecies were reported as new to Korea by Kolbe(1886), Heyden(1887), Miwa(1929), Mochizuki(1937), Kishii(1961) and Korean Society of Plant Protection(1972). In this paper, three species(*Agrypnus setigera*, *A. miyamotoi*, *A. hyponicola*) are reported as new to Korea with descriptions and figures. And a key to the Korean species of Agrypninae is presented.

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MATERIALS AND METHODS

External structures and the male genitalia were examined for identification. The male genitalia examined were prepared by the following method; Entire abdomen was removed from the specimen, placed it in 10 percent solution of potassium hydroxide, and boiled for 10 to 30 minutes depending on insect size and degree of sclerotization. Then the male genitalia was removed from the abdomen and washed in distilled water. The cleared genitalia was placed in very weak solution of alcohol and stored in a micro-vial containing glycerin. This storing method is preferred to placing the genitalia on a slide, mainly because the genitalia could be placed in a dish of alcohol and manipulated to any desired angle.

Several measurements were frequently used in the descriptions; Pronotal Index(PI) was obtained with dividing the length of the pronotum measured along the midline by the maximum width of the pronotum, and multiplied by 100; Length of Elytron(LE) was measured along the suture from the humeral margin to the apex. And body width(BW) was measured across the base of the closed elytron.

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SYSTEMATICS

Subfamily Agrypninae Fleutiaux & Jeannel, 1919 Afr. or. Col., 8 : 6.

녹슬은방아벌레아과(신칭)

Agrypninae is a large subfamily with over 1,000 known species under 19 genera. The largest genus is Agrypnus Eschscholtz with 409 species throughout the world(Hayek, 1973).

This subfamily is characterized obviously by the scale-like vestiture covering the whole body, and a pair of deep furrows along the pro-sternopleural sutures in which antennae are accommodated. The furrows occupy at least one third of the length of the sutures.

Key to the Korean genera of subfamily Agrypninae

- 1. Mesepimeron forming a part of the margin of mid-coxal cavityDanosoma
- 1'. Mesepimeron separated from the margin of mid-coxal cavityAgrypnus

Genus Agrypnus Eschscholta, 1829 in Thon, Ent., 2(1) : 32 녹슬은방아벌레속

Genotype-Elater murinus Linnaeus, by subsequent designation (Westwood, 1838, Coleoptera: 1-44).

Distributions. Agrypnus species have been recorded from all parts of the world except South America. The largest number of species has been described from the Oriental and Australian regions.

Key to the Korean species of genus Agrypnus

- 1. Grooves on meso-and metapleuron to keep femora; and hind femora not produced beyond outer margin of epipleuron in situ.....2
- 1'. Epipleuron without such groove; mid-and hind femora produced beyond the sides of elytra in situAgrypnus argillaceus

- 2. Pronotum with a pair of nodules (A. binodulus).....3
- 2'. Pronotum without any nodule4
- 3. Nodules small; legs reddish brown A. binodulus binodulus
- 3'. Nodules large; legs blackish brownA. binodulus coreanus
- 4. Pro-and metapleura with oblique grooves to keep tarsi5
- 4'. Pro-and metapleura without such groove 6
- 5. Elytra with long erected hairs and densely covered scales.....A. setigera
- 5'. Elytra covered with scales only without any hair.....A. herzi
- 6. Lateral margin of pronotum crenulate.....7
- 6'. Lateral margin of pronotum not crenulate A. fuliginosus
- 7. Hind-wing well developed for flight.....8
- 7'. Hind-wing degenerated and vestigialA. miyamotoi
- 8. Pronotum convex; body small, shorter than 8mm..... A. hyponicola
- 8'. Pronotum flat, somewhat depressed; body longer than 8mm9
- 9. Body with cinereous scale-like hairsA. depressus
- 9'. Body with tawny scale-like hairs A. scrofa

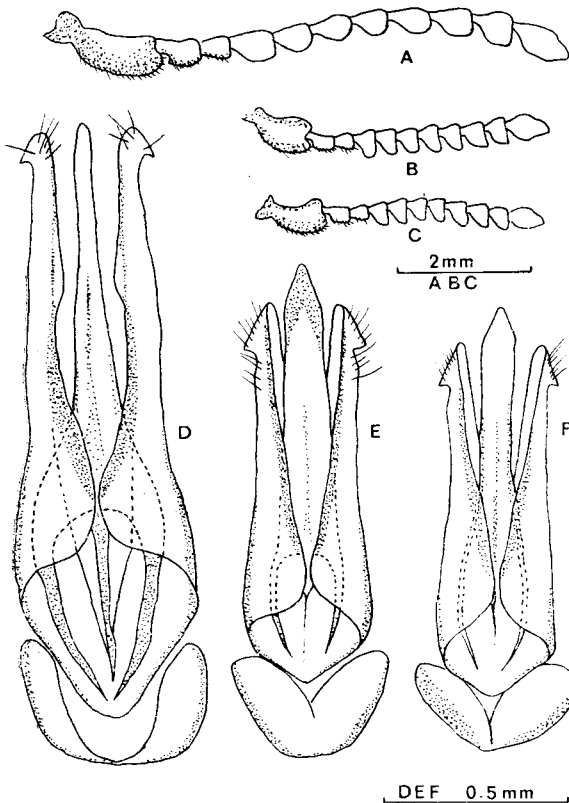
1. Agrypnus setigera (Bates) Figs. A,D
털녹슬은방아벌레(신칭)

Lacon setigera Bates, 1866, Proc. Zool. Soc. London, 2, p. 348 ; Candèze 1874, pp. 45 et 61 ; Miwa, 1929, p. 229 ; Miwa, 1933, p. 9 ; Miwa, 1934, p. 182.

Adelocera(Adelocera) setigera; Ohira, 1969, p. 28.

Agrypnus setigera ; Hayek, 1973, p. 113.

Male. Body dark reddish brown tinged with russet; antennae and palps dark yellowish or-



Figs. A-C. antennae(A. *Agrypnus setigera*. B. *A. miyamotoi*, C. *A. hyponicola*) D-F. male genitalia (D. *A. setigera*, E. *A. miyamotoi*, F. *A. hyponicola*)

ange; legs rebbish brown; vestiture long and semidecumbent, yellowish brown coloured. Length 14.8~16.4(15.8)mm, width(BW) 5.08~5.67(5.37)mm. Hind-wing well developed.

Pronotum: Pronotal Index(PI) 79~88(85); sides never crenulate and rounded, narrow anteriorly, wider posteriorly, moderately densely punctated, punctures about 0.02mm in diameter; vestiture moderately dense; without any nodule.

Elytra: length(LE) 10.9~12.1(11.4)mm; interneurs punctated, punctures becoming confluent and deeply impressed humerally; intervals slightly convex with very fine and moderately dense punctures humerally; apex sharp.

Genitalia: aedeagus narrow, generally tapering towards apex, apex rounded; parameres elongated, almost as long as aedeagus, outer

margin broadly sinuated with prominent subapical tooth, apex rounded and with a few setae; strongly expanded laterally below the subapical tooth(lateral view); furcal arms narrow, tapered toward apex, inwardly bent and converging apically. Length 1.98~2.11(2.05) mm, width 0.64~0.70(0.68)mm.

Female. Similar to male but larger. Length 16.5~18.0(17.47)mm, BW 5.67~5.89(5.80) mm, LE 11.8~13.1(12.67)mm, PI 81~85(83).

Specimen examined. 1♀, An-Yang, 13. VI. 1957; 1♂, Yang-Ji, 8. VI. 1959; 1♂, Suweon, 18. VI. 1959; 1♂, Seoul, 12. V. 1963; 1♀, Kwang-Kyo, 2. VI. 1963; 1♂, 1♀, Suweon, 17. V. 1968; 1♂, Mt. Ji-ri, 16. VII. 1976; 1♂, Yong-in, 2. VI. 1984.

Distribution. Korea, Japan, Formosa.

Remarks. This species can be easily distinguished from other Korean species of sub-family Agrypninae by the long erected hairs on elytra and the oblique tarsal groove on pro-and meta-pleura.

2. *Agrypnus fuliginosus* (Candèze)

가는꽃녹슬은방아벌레

Lacon filiginosus Candèze, 1865, Elat. nouv. I. (Mem. Acad. Belg.), p.10; Miwa, 1929, p.343; Miwa, 1934, p.68; Kor. Soc. Plant Prot., 1972, p.133.

Adelocera(Sabikorius) filiginosus; Ohira, 1969, p.28.

Agrypnus fuliginosus; Hayek, 1973, p.157.

Distribution. Korea, Japan.

Remarks. Authors were unable to collect or have chance to examine this species. "List of Plant Diseases, Insect Pests and Weeds" published by Korean Society of Plant Protection (1972) listed this species to be distributed in Korea.

3. *Agrypnus herzi* (Koenig)

헤르쯔녹슬은방아벌레

Lacon herzi Koenig, 1887, Horac. Soc. Ent. Ross., XXI, p. 353; Miwa, 1934, p. 162; Cho, 1957, p. 220; Zool. Soc. Kor., 1968, p. 110; Cho, 1960, pp. 295 & 300.

Agrypnus herzi; Hayek, 1973, p. 163.

Distribution. Korea, Manchuria.

Remarks. Authors were unable to collect or have chance to examine this species. However, this species was first described by Koenig (1887) as *Lacon herzi* with specimens collected by Sato from Suweon. Since, no further record was found.

4. *Agrypnus binodulus binodulus* (Motschulsky) 녹슬은방아벌레

Lacon binodulus Motschulsky, 1860, p. 8; Heyden, 1887, p. 256; Okamoto, 1924, p. 182; Miwa, 1929, p. 343; Miwa, 1931, p. 259; Miwa, 1933, p. 157; Miwa, 1934, p. 162; Mochizuki, 1937, p. 85; Cho, 1957, p. 220; Cho, 1963, p. 207; Zool. Soc. Kor., 1968, p. 110; Cho, 1969, pp. 295 & 300; Kor. Soc. Plant Prot., 1972, p. 133.

Agrypnus(A.) binodulus binodulus; Ohira, 1969, p. 29.

Agrypnus binodulus; Hayek, 1973, p. 131.

Specimens examined. 1♂, Suweon, 6. VI. 1922; 3♂♂, Suweon, 10. IV. 1923; 1♂, Suweon, 28. V. 1923; 1♂, Suweon, 6. V. 1924; 1♀, Mt. O-Dae, 7. VII. 1962; 2♂♂, Suweon, 2. VI. 1962; 2♀♀, Mt. O-Dae, 21. VII. 1974; 1♀, Suweon, 29. VI. 1983; 1♂, Mt. Weol-ak, 20. VI. 1984.

Distribution. Korea, Japan, Europe, China.

Remarks. This species is world widely distributed from Asia to Europe and can be distinguished from other species within the subfamily Agrypninae by having a pair of nodules on the pronotum.

5. *Agrypnus binodulus coreanus* Kishii

한국녹슬은방아벌레(신칭)

Agrypnus binodulus coreanus Kishii, 1961, p. 24; Ohira, 1969, p. 29; Ohira, 1976, p. 365.

Specimens examined. 33♂♂, 28♀♀(with nationwide localities).

Distribution. Korea, Japan(Tsushima).

Remarks. Kishii(1961) distinguished this subspecies from the original species with its distinct nodules on the pronotum. Korean name is newly presented here because it has not been decided.

6. *Agrypnus argillaceus* (Solsky)

대유동녹슬은방아벌레

Lacon argillaceus Solsky, 1970, p. 360; Candèze, 1874, p. 209.

Lacon cinnamomeus Candèze, 1874, p. 76.

Paralacon cinnamomeus; Reitter, 1905, Bestin. Tab. LVI: p. 6.

Paralacon argillaceus; Miwa, 1929, p. 223; Miwa, 1929, p. 223; Miwa, 1934, p. 162; Mochizuki, 1937, p. 55; Cho, 1957, p. 220; Zool. Soc. Kor., 1968, p. 110; Cho, 1969, p. 300.

Agrypnus argillaceus; Hayek, 1979, p. 208.

Specimens examined. 22♂♂, 15♀♀(with nationwide localities except island regions)

Distribution. Korea, Formosa, Indo-China, China, Mongolia and Siberia.

Remarks. This species can be distinguished easily from other species by its reddish body colour, and the epipleuron without any groove for accommodating femora.

7. *Agrypnus depressus* (Candèze)

진녹슬은방아벌레

Lacon depressus Candèze, 1874, p. 77; Miwa, 1931, p. 259; Miwa, 1933, p. 151; Miwa, 1934, p. 162; Cho, 1957, p. 220; Cho, 1969, p. 300; Zool. Soc. Kor., 1968, p. 110.

Agrypnus depressus; Hayek, 1973, p. 149.

Distribution. Korea.

Remarks. Candeze(1874) described this species as *Lacon depressus* new to science with specimens from Seoul. According to Candeze's description, this species is similar to *A. scrofa*, but distinguished by having cinereous scales. After the first recording, no more specimen has been collected.

8. *Agrypnus miyamotoi* (Nakane et Kishii)

Figs. B.C 해변애녹슬은방아벌레(신칭)

Cryptolacon miyamotoi Nakane et Kishii, 1955,
Bull. Osaka Mun. Mus. Nat. Hist., 2, p. 2.

Colaulon(Cryptolacon) miyamoti; Kishii, 1964,
Bull. Heian High school, 8, pp. 38.

Agrypnus miyamotoi; Hayek, 1973, p. 183.

Male. Body dark blackish brown tinged with rasset; antennae and palps reddish brown; legs reddish brown; vestiture short and semidecumbent, ash-coloured. Length 6.60~7.20(6.91) mm, BW 2.68~2.88(2.77)mm. Hind-wing degenerated and vestigial.

Pronotum: PI 86~91(88); sides feebly crenulate, broadly rounded, widest across middle; never bending outward posteriorly; disc moderately convex without any furrow; moderately densely punctated, punctures small, less than 0.03mm in diameter; vestiture moderately dense; hind angles never divergent; without any nodule.

Elytra: LE 4.21~4.66(4.48)mm; interneurs densely punctated, with fine and moderately dense punctures; vestiture appears to be moderately dense; apex round.

Genitalia: aedeagus stout, apex pointed; parameres wide and shorter than aedeagus, outer margin broadly sinuate with prominent subapical tooth, apex with some setae. Length 1.40~1.52(1.46)mm, width 0.40~0.48(0.44)mm.

Female. Similar to male, very difficult to distinguish their sex by external characters.

Length 7.13~8.10(7.68)mm, BW 2.75~3.17(2.99)mm, LE 4.80~5.27(5.50)mm, PI 77~88(84).

Specimens examined. 3♂♂, 4♀♀, Seoguipo, 11.I. 1985; 1♂, 1♀, Seoguipo, 15. I. 1985; 1♂, Seoguipo, 13.II. 1985.

Distribution. Korea(Is. Jeju), Japan(Loochoo).

Remarks. This species is similar to *A. hypnicola* in general characteristics. However, this species can be distinguished with its degenerated and vestigial hind-wings.

9. *Agrypnus hypnicola* (Kishii) Figs. C, F

꼬마애녹슬은방아벌레(신칭)

Colauron(Cryptolacon) hypnicola Kishii, 1964,
Bull. Heian High School, 8, p. 20; Ohira,
1969, p. 30.

Agrypnus hypnicola; Hayek, 1973, p. 165.

Male. Body dark; antennae and palps yellowish brown, legs dark reddish brown; vestiture short and semidecumbent, ash-coloured. Length 6.38~7.92(6.96)mm, BW 2.55~3.07(2.73)mm. Hind-wing well developed.

Pronotum: PI 81~87(84); sides feebly crenulate, broad and round, widest across middle; disc moderately convex without any furrow; moderately densely punctated, puncture small, less than 0.03mm in diameter; vestiture moderately dense; hind angles feebly divergent; without any nodule.

Elytra: LE 4.20~5.26(4.56)mm; interneurs densely punctated with fine and moderately dense punctures; vestiture appears to be moderately dense; apex round.

Genitalia: similar to *A. miyamotoi*, but small and frail, furcal arms feebly convergent. Length 1.16~1.26(1.21)mm, width 0.39~0.42(0.41)mm.

Specimens examined. 11♂♂, 13♀♀, Seoguipo, 11.I. 1985; 1♂, Seoguipo, 15.I. 1985;

1♂, Seoguipo, 13.II. 1985.

Distribution. Korea(Is. Je-ju), Japan.

적 요

10. *Agrypnus scrofa* (Candèze)

애녹슬은방아벌레

Lacon scrofa Candèze, 1973, Mem. Soc. Sc. Liege(2) V., p.4; Kolbe, 1886, p.197; Miwa, 1929, p.229; Miwa, 1933, p.152; Miwa, 1934, p.162; Mochizuki, 1937, p.82; Cho, 1957, p.220; Zool. Soc. Kor., 1968, p.110.

Lacon(Cryptolacon) scrofa; Ohira, 1969, p.30.

Agrypnus scrofa; Hayek, 1973, p.208.

Specimens examined. 2♂♂, 2♀♀, Suweon, 3. VI. 1986; 2♂♂, Suweon, 5. VII. 1986.

Distribution. Korea, Japan, Europe.

Genus *Danosoma* Thomson, 1859 Skand. Col., Vol. 1, p.103.

알락녹슬은방아벌레속(신칭)

Genotype-*Elater conspersa* Gyllenhal, 1817, Ins. Suec., Vol. 1, p.377.

Distribution. Northern palaeartic and northern holarctic regions.

11. *Danosoma conspersa* (Gyllenhal)

알락녹슬은방아벌레

Elater conspersa Gyllenhal, 1808, Ins. Svec., vol. 1. p.377.

Adelocera conspersa; Candèze, 1857, Mon., I; p.78; Miwa, 1934, p.145; Mochizuki, 1937, p.55; Zool. Soc. Kor., 1968, p.110.

Danosoma conspersa; Hayek, 1973, p.89.

Distribution. Korea(Northern area), North Europe, Siberia and Saghalien.

Remarks. This species is distributed throughout the Northern area of palaeartic region. Mochizuki(1937) reported this species for the first time in Korea with one specimen from Weon-san. Since then, no further record was found.

본 연구는 한국산 녹슬은방아벌레아과(방아벌레과)의 분류학적 연구를 위하여 1984년 4월부터 1986년 9월까지 경기도 수원근교와 남해안지역(해남, 완도, 목포, 남해), 강원·충북지역(춘천, 충주)과 제주도에서 채집한 표본과, 서울대학교 농과대학 및 농촌진흥청 농업기술연구소 소장표본을 분류, 동정하였다. 아울러 문헌상의 기록을 종합, 정리한 결과 2속 10종 1아종이 밝혀졌으며, 그중 3종(*Agrypnus setigera*, *A. miyamotoi*, *A. hypponicola*)은 한국 미기록종으로 기재한다.

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