

Taxonomic Study of the Genera *Seleucus* Holmgren and *Opheltes* Holmgren (Hymenoptera: Ichneumonidae: Ctenopelmatinae) from Korea

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ABSTRACT

The genera *Seleucus* and *Opheltes* have been reported, each of which contains two species in the world, [*S. cuneiformis* (Holmgren, 1860) and *S. exareolatus* (Strobl, 1904) for the genus *Seleucus*; *O. glaucopterus* Linnaeus, 1758 and *O. japonicus* (Cushman, 1924) for the genus *Opheltes*]. In this study, the genus *Seleucus* is discovered for the first time in Korea with *S. cuneiformis*, and also *O. japonicus* is reported for the first time from Korea. We redescribed Korean *Seleucus* and *Opheltes* species, and provide keys and photographs of the Korean species.

Key words: *Seleucus cuneiformis*, *Opheltes japonicus*, Ctenopelmatinae, Ichneumonidae, Korea

INTRODUCTION

The genera *Seleucus* Holmgren and *Opheltes* Holmgren are small groups belonging to the subfamily Ctenopelmatinae, and each genus is previously reported with two species worldwide (Townes, 1971). Usually, members of this subfamily attack symphytan sawflies and rarely lepidopteran eggs or larvae as koinobiont endoparasitoids. *Seleucus cuneiformis* is distributed in the Palearctic Region, but *S. exareolatus* is only reported in Austria. In this study, we report the genus *Seleucus* for the first time in Korea with *S. cuneiformis* Holmgren and also report *Opheltes japonicus* Cushman in already known Korean genus *Opheltes*. We redescribed Korean *Seleucus* and *Opheltes*, and provide key to the species and photographs of the Korean species.

MATERIALS AND METHODS

The examined specimens were assembled by field collection from 1988 to 2005. Assembled specimens were examined by the stereo microscope (Zeiss Stemi SV 11 Apo) and key characters were given by photographs. The morphological terminology used in this study was followed by Gauld (1976).

The abbreviations IOD, OOD and MOD are used for distance between lateral ocelli, distance between lateral ocellus and compound eye, maximum diameter of lateral ocellus.

All the materials examined are deposited in the Depart-

ment of Biology, Yeungnam University in Korea.

The indices of lengths and abbreviations are as follow:

BAI: Branchio-anal index (forewing) = $Cu1 (cua-1mcu)/1A (Cua-culb)$;

BI: Branchial index (forewing) = $shortest\ distance\ Cu1\ and\ 1a (distalend)/shortest\ distance\ Cu1\ and\ 1A (Proximalend)$;

CI: Cubital index (forewing) = $Cu1 (1mcu-Cu1a)/Cu1b (Cu1a-1A)$;

DAI: Dorsal abdominal index = $Dorsum\ of\ tergite\ 2/Dorsum\ of\ tergite\ 3$;

DBI: Disco-brachial index (forewing) = $Cu1 (cua-1mcu)/1mcu (Cu1-2+3rm)$;

LAI: Lateral abdominal index = $Dorsum\ of\ tergite\ 2/Apical\ depth\ of\ tergite\ 2\ laterally$;

NI: Nervellar index (hindwing) = $Cu1 (cua-M)/Cua (Cu1-1A)$;

PI: Petiolar index = $Distance\ from\ anterior\ margin\ of\ petiolar-spiracle\ to\ base\ of\ tergite\ 1/Distance\ from\ posterior\ margin\ of\ petiolar-spiracle\ to\ apex\ of\ tergite\ 1$;

RI: Radial index (hindwing) = $Rs (R1-1rm)/1rm (Rs-M)$;

TI: Trochanteral index (hindleg, medianventrally) = $Trochanter/Trochantellus$;

CB: Chungcheongbuk-do

GB: Gyeongsangbuk-do

GG: Gyeonggi-do

GW: Gangwon-do

JB: Jeollabuk-do

TD: Type depository

TL: Type locality

TS: Type species

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HU: Hokkaido University, Faculty of Agriculture, Entomological Institute, Sapporo, Japan.

LS: Linnaean Society, Burlington House, Picadilly, London, England, United Kingdom.

NR: Naturhistoriska Riksmuseet, Sektionen für Entomologi, S-10405 Stockholm, Sweden.

USNM: U.S. National Museum of Natural History, Smithsonian Institute, Washington, D.C., 20560, U.S.A

SYSTEMATIC ACCOUNTS

Order Hymenoptera

Family Ichneumonidae

Subfamily Ctenopelmatinae

Genus ^{1*}*Seleucus* Holmgren, 1860

Seleucus Holmgren, 1860: 111. Type species: *Seleucus cuneiformis* Holmgren

Diagnosis. Frons with a sharp median vertical carina. Mandible broad, its teeth equal. Mesopleurum polished, with moderately coarsely punctures, the specular area impunctate. Areolet pointed anteriorly, the second intercubitus weak. Abdomen of female compressed and quite elongated, the compression beginning with segment III. Ovipositor sheath about 0.1x as long as forewing, somewhat upcurved.

^{2*}*Seleucus cuneiformis* Holmgren, 1860

Seleucus cuneiformis Holmgren, 1860: 111. Type: ♀, TL: Sweden, TD: NR.

Materials examined. JB Namwon-si Sannae-myeon Mt. Jiri, 26. VII.-12. X. 2001, J.W. Lee, 3 ♀ ♀. CB Danyang-gun Gagok-myeon Mt. Sobaek, 30. VII. 1988, K.H. Kim, 1 ♀.

Redescription. Female: Face coarsely punctated, convex, width of lower face about 2.47x height; Frons with vertical carina (Fig. 1A). Antenna with 27-28 flagellar segments; Length of first flagellar segment about 2.87x as long as the maximum width, almost equal to 2nd segment; Inner margin of eyes parallel; Malar space narrow, about 0.44x the basal width of mandible; Clypeus weakly convex, broadly lenticular in outline, its margin thick, with a fringe of closely spaced bristles; Mandible broad, weakly twisted, upper tooth and lower tooth almost equal in length; IOD about 1.75x as wide as MOD (Fig. 1B); Occipital carina complete. Mesoscutum with moderate, coarse punctures, notaulus absent; Mesopleurum polished, with moderate, coarse punctures, the specular area impunctate (Fig. 1C); Epicnemial carina, prepectal carina and posterior transverse

carina complete; Propodeum as figured (Fig. 1D). Legs slender, tarsal claws simple. Forewing length 5.5 mm with Cu1 between 1m-cu and Cula 1.60x as long as Culb between 1A and Cu1a, Cu1 between Cua and 1m-cu 0.61x as long as abscissa of 1m-cu, maximum height of second discal cell about 0.61x as long as Cula and 2m-cu; Areolet pointed anteriorly, the second intercubitus weak (Fig. 1F). First tergite rather slender but broader apically, its spiracle a little behind the middle and glymma absent. Abdomen of female compressed and quite elongate, the compression beginning with segment; Epipleura broad, hairless; Epipleurum of tergite II separated by a crease based of the spiracle, the rest of this epipleurum and all of the following not separated; Ovipositor sheath about 0.1x as long as forewing, somewhat upcurved (Fig. 1E).

Color. Face black; Antenna dark brown; Compound eye and ocelli gray; Mandible brown; Palpi yellow. Thorax black; Legs yellow. Abdomen dark brown, tergite of ventral and ovipositor sheath with tawny.

Measurements. BAI: 0.76, BI: 1.5, CI: 1.77, DAI: 0.61, DBI: 0.64, LAI: 2.2, NI: 2.5, PI: 1.07, RI: 4.47, TI: 1.4.

Distribution. Korea, Austria, Czech Republic, Germany, Japan, Poland, Russia.

Male. Unknown.

Genus ^{3*}*Opheltes* Holmgren, 1859

Opheltes Holmgren, 1859: 323. TS: *Ichneumon glaucopterus*

Diagnosis. Head swollen behind eyes. Often with thorax and terminal abdominal segments black marked. Scutellum usually pyramidal in profile. Forewing 15 mm, infuscate. Propodeum with a pair of median longitudinal carinae which are anteriorly raised into a tubercle. Hindwing with base of distal abscissa of Cu1 equidistant between M and 1A, or closer to M.

Key to the Species of the Genus *Opheltes*

1. Apical margin of wings maculated. Propodeal spiracle round, circular shape. Width of lower face more than 2x height *O. japonicus*
- Apical margin of wings not maculated. Propodeal spiracle long, oval shape. Width of lower face less than 2x height 2
2. Tarsal claws pectinated. Frontal orbit of frons projected. Posterior half of first tergite and whole second tergite dorsally black. Forewing length shorter than 18 mm *O. glaucopterus glaucopterus*
- Tarsal claws simple. Frontal orbit of frons not projected.

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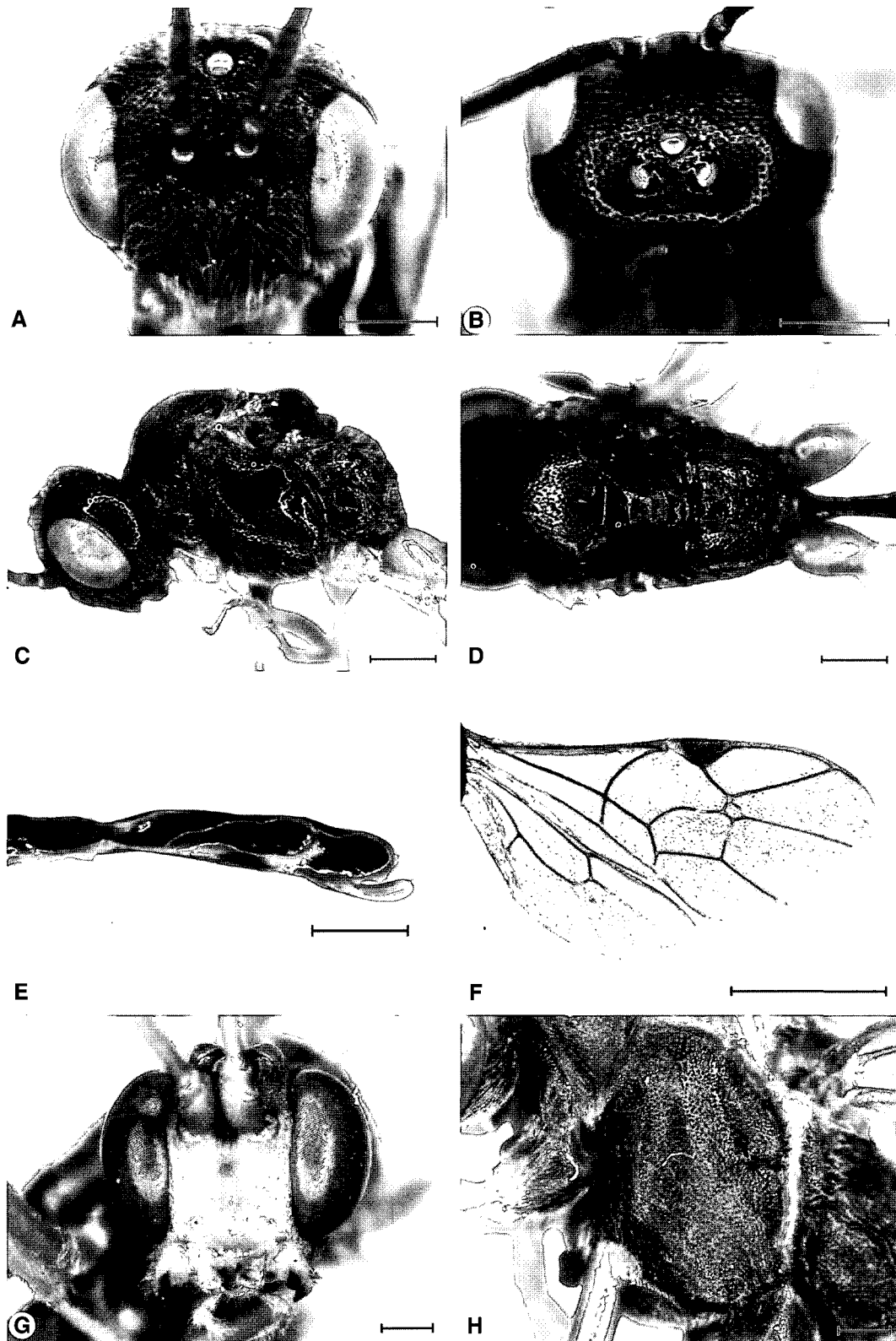


Fig. 1. *Seleucus cuneiformis*. A: head, frontal view; B: head, dorsal view; C: head and thorax, lateral view; D: scutellum and propodeum; E: ovipositor sheath; F: right wing. *Opheltes glaucopterus apicalis*. G: head, frontal view; H: thorax, lateral view. Scale bars=0.5 mm (A-E, G, H), 2 mm (F).

First tergite and second tergite dorsally reddish brown.
Forewing length longer than 18 mm
..... *O. glaucopterus apicalis*

¹**Opheltes glaucopterus apicalis* Matsumura, 1912

Astiphroma apicalis Matsumura, 1912: 111. Type: ♀, TL: Honshu, Kyushu, TD: HU

Opheltes major Cushman, 1924: 16. Type: ♀, TL: Gifu, TD: USNM

Opheltes glaucopterus var. *fuscus* Uchida, 1928: 187. Type: ♀, TL: Sapporo, Otaru, Jozankei, all in Hokkaido, Koto, TD: HU.

Opheltes apicalis: Matsumura, 1925: 36; Matsumura, 1925: 25.

Opheltes glaucopterus var. *apicalis*: Uchida, 1928: 186; Matsumura, 1930: 118; Matsumura, 1931: p58; Uchida, 1935; Raata & Tamanuki, 1939: 25.

Opheltes glaucopterus var. *major*: Uchida, 1928: 187.

Opheltes glaucopterus: Ishii, 1932: p419; Matsumura, 1932: 40.

Opheltes glaucopterus f. *fuscus*: Uchida, 1935: 120.

Materials examined. GW Hongchen-gun Nae-myeon Mt. Odae, 20. IX. 1971, J.I. Kim, 1 ♀.

Redescription. Face densely punctated, width of lower face about 1.62x height. Antenna with 55 flagellar segments; Length of first flagellar segment about 1.57x as long as 2nd segment; Eyes with inner margins almost parallel ventrally; Malar space as long as mandibular width at apex; Clypeus separated from face by distinct groove, clypeus plus face forming weakly convex surface; Labrum large and conspicuously exposed ventral to clypeal margin; Maxillary palpus elongate, reaching mesopleuron; Mandible broad and not twisted apically. Mandible upper tooth a little shorter than lower tooth in length; IOD about 0.25x as wide as MOD; Occipital carina complete. Mesoscutum with densely punctures, notaulus short; Scutellum carina absent; Pronotum spiracle partially coved; Epicnemial carina and prepectal carina complete; Posterior transverse carina of the mesosternum absent. Propodeum as figured (Fig. 2A). Propodeal spiracle elongate. Legs slender, front tibial spur with a membranous flange. Tarsal claws simple. Forewing length 17 mm with Cu1 between 1m-cu and Cula 0.91x as long as Culb between 1A and Cula, Cu1 between Cua and 1m-cu 0.64x as long as abscissa of 1m-cu, maximum height of second discal cell about 0.51x as long as Cula between Cu1 and 2mcu (Fig. 2C); Hind wing with 11 distal hamulus; Metasomal segment 1 with spiracle nearly middle. First tergite in dorsal view with anterior part slender, and posterior

part wide. First tergite rather slender but broader apically, its spiracle colse middle and glymma absent. Abdomen laterally compressed.

Color. Face reddish brown; Antenna brown; Compound eye and ocelli black; Mandible reddish brown; Palpi reddish brown. Thorax black; Legs black and reddish brown. Abdomen reddish brown and black.

Korean Records. Seoul (Kim, 1966, 1970)

Measurements. BAI: 0.85, BI: 1.18, CI: 0.91, DAI: 1.01, DBI: 0.64, NI: 0.95, PI: 0.84, RI: 2.92, TI: 2.16.

Distribution. Korea, Japan, Russia

Host Records. *Cimbex japonica* (Cimbricidae: Hymenoptera, =*Cimbex femorata* L. var. *japonica*), *Dendrolimus* sp. (Lasiocampidae: Lepidoptera).

²**Opheltes glaucopterus glaucopterus* Linnaeus, 1758

Ichneumon glaucopterus Linnaeus, 1758: 566. Type: ♀, TL: non, TD: LS.

Opheltes glaucopterus: Holmgren, 1858: 323; Kokujev, 1913: 164; Uchida, 1928: 186; Meyer, 1930: 178; Matsumura, 1931: p58; Roman, 1931: 20; Meyer, 1935: 349; Uchida, 1942: 132; Uchida, 1955: 128.

Materials examined. Mt. Dobong, 5. VI. 1961, J.G. Yu, 1 ♀, GG Gapyeong-gun Mt. Myeongji, 19. VIII. 1981, D.G. Lee, 1 ♀, Gwangju-si Jungbu-myeon Namhansanseong, 6. VI. 1996, H.J. Hong, 1 ♀, Mt. Munsu, 7. VI. 1971, G.H. Nam, 1 ♀, Namyangju-si Mt. Cheonma, 2. VI. 1984, M.A. Park, 1 ♀, GW Gachilbong 21. VI. 1984, Y.C. Heo, 1 ♂, Gangchon 6. VI. 1984, G.J. Park, 1 ♂, Pyeongchangdong Mt. Odae, 15. VII. 1992, M.U. Jo, 1 ♂

CB Boeun-gun Mt. Sokri, 20. V. 1986, TH. Kim, 1 ♂, Yeongdong-gun Mt. Minjuji, 5. VI. 1993, J.S. Lee, 1 ♀, Yeongdong-gun Mt. Minjuji, 6. VI. 1993, D.H. Lee, 1 ♀, GB Bonghwa-gun Mt. cheongryang, 19. VII. 1998, Y.G. Choi, 1 ♀, Yeongju-si Punggi-eup 13. VII. 1997 (BL), W.J. Jang, 1 ♀, Daejeon Donggu Yongmaundong 30. V. 1993, E.J. Lee, 1 ♂, Mt. Dobong 27. VI. 1954, Y.C. Kim, 1 ♀.

Redescription. Face densely punctated, width of lower face about 1.74x height. Antenna with 53 flagellar segments; Length of first flagellar segment about 1.57x as long as 2nd segment; Eyes with inner margins almost parallel ventrally; Malar space as long as mandibular width at apex; Clypeus separated from face by distinct groove, clypeus plus face forming weakly convex surface; Labrum large and conspicuously exposed ventral to clypeal margin; Maxillary palpus elongate, reaching mesopleuron; Mandible broad and not twisted apically. Mandible upper tooth a little shorter than lower tooth in length; IOD about 0.36x as wide as

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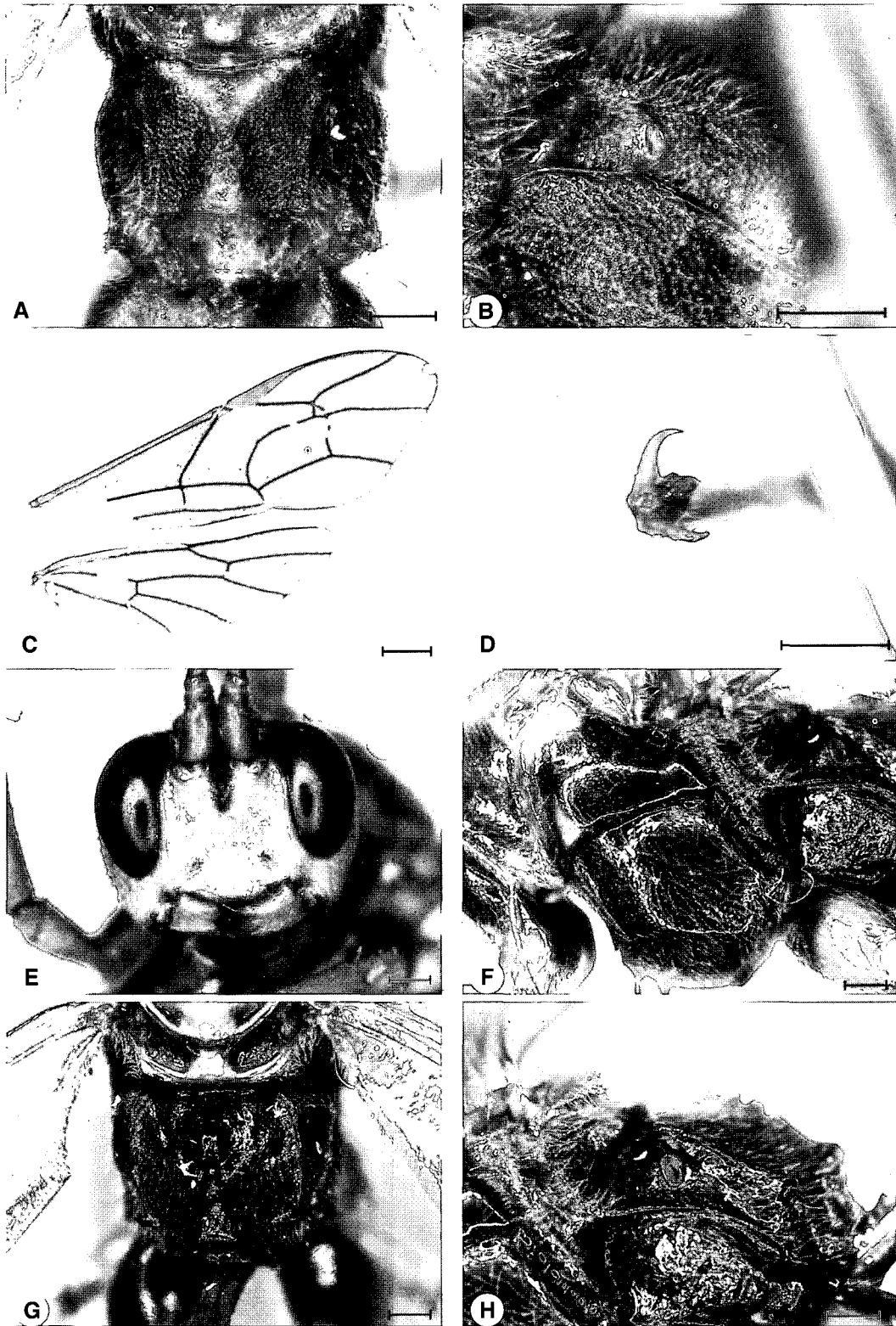


Fig. 2. *Opheltes glaucopterus apicalis*. A: scutellum and propodeum; B: propodeum and spiracle, lateral view; C: right wing; D: hind tarsal claw. *Opheltes glaucopterus glaucopterus*. E: head, frontal view; F: thorax, lateral view; G: scutellum and propodeum; H: propodeum and spiracle. Scale bars=0.5 mm (A-B, D-H), 2 mm (C).

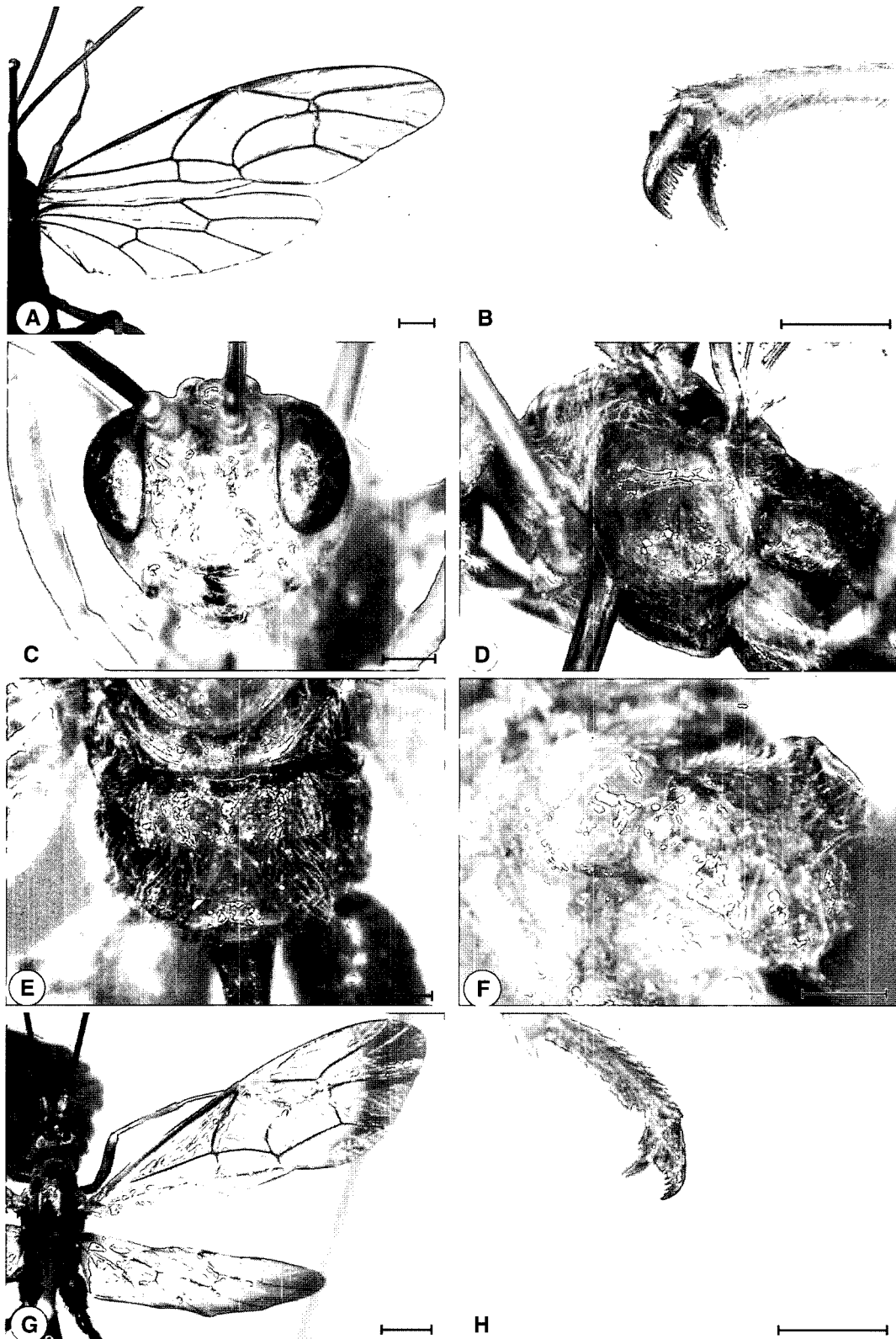


Fig. 3. *Opheltes glaucopterus glaucopterus*. A: right wing; B: hind tarsal claw. *Opheltes japonicus*. C: head, frontal view; D: thorax, lateral view; E: propodeum; F: propodeum and spiracle; G: right wing; H: hind tarsal claw. Scale bars=2 mm (A, G), 0.5 mm (B-F, H).

MOD; Occipital carina complete. Mesoscutum with densely punctures, notaulus short; Scutellum carina absent; Pronotum spiracle partially coved; Epicnemial carina and prepectal carina complete; Posterior transverse carina of the mesosternum absent. Propodeum as figured (Fig. 2G). Propodeal spiracle elongate. Legs slender, front tibial spur with a membranous flange. Tarsal claws pectinated. Forewing length 22 mm with Cu1 between 1m-cu and Cula 0.66x as long as Culb between 1A and Cu1a, Cu1 between Cua and 1m-cu 0.58x as long as abscissa of 1m-cu, maximum height of second discal cell about 0.47x as long as Cula between Cu1 and 2m-cu (Fig. 3A); Hind wing with 12 distal hamulus; Metasomal segment 1 with spiracle nearly middle. First tergite in dorsal view with anterior part slender, and posterior part wide. First tergite rather slender but broader apically, its spiracle colse middle and glymma absent. Abdomen laterally compressed. Ovipositor sheath about 0.1x as long as forewing.

Color. Face reddish brown; Antenna brown; Compound eye and ocelli black; Mandible reddish brown; Palpi reddish brown. Thorax black; Legs black and reddish brown. Abdomen reddish brown and black.

Korean Records. Gwangneung, Mt. Dobong, Mt. Soyeo, Mt. Yongmun, Seogwangsa (Kim, 1966, 1970)

Measurements. BAI: 0.90, BI: 0.83, CI: 0.66, DAI: 1.01, DBI: 0.58, NI: 0.40, PI: 0.91, RI: 2.43, TI: 3.04.

Distribution. Korea, Austria, Azerbaijan, Belarus, Belgium, Bulgaria, Canada, China, Czechoslovakia, Denmark, Finland, France, Germany, Hungary, Ireland, Israel, Italy, Japan, Latvia, Lithuania, Moldova, Netherlands, Norway, Poland, Romania, Russia, Spain, Sweden, Tunisia, Turkey, U.S.A., United Kingdom.

Host Records. *Cimbex femorata*, *Paleocimbex carinulata* (Cimbicidae: Hymenoptera), *Dendrolimus superans* (Lasiocampidae: Lepidoptera).

¹**Opheltes japonicus* (Cushman, 1924)

Nephopheltes japonicus Cushman, 1924. Proc. U.S. Natl. Mus. 64(20): 17. Type: ♀. TL: Gifu, TD: U.S. National Museum of Natural History, Smithsonian Institute, Washington, D.C., 20560, U.S.A.

Opheltes okadai Uchida, 1942. Insecta Matsumurana 6: 132. Type: ♂, TL: Tiehling in Manchuria, TD: Hokkaido University, Faculty of Agriculture, Entomological Institute, Sapporo, Japan.

Nephopheltes japonicus: Uchida, 1928: 187.

Opheltes japonicus: Townes, 1945: 495; Townes, 1957: 112.

Materials examined. GG Dongducheon-si Mt. Soyo, 6. VI. 1980, H.J. Im, 1♂. GW Wonju Maeji-ri Yonsei Univ, 4. VI. 1999, H.J. Kang & J.A. Yeom & S.Y. Kim, 1♂, GB Yeungju-si Sunheung-myeon Mt. Soback, 6. VI. 1981, M.O. Sim, 1♀, GN Miryang Geonjangsa, 24. V. 1987, J.H. Kim, 1♂, Sacheon-si Gonmyeong-myeon Dasolsa, 26. V. 1974, 1♀.

Redescription. Face densely punctated, width of lower face about 2.12x height. Antenna with 45 flagellar segments; Length of first flagellar segment about 1.57x as long as 2nd segment; Eyes with inner margins almost parallel ventrally; Malar space as long as mandibular width at apex; Clypeus not separated from face by distinct groove, clypeus plus face forming weakly convex surface; Labrum large and conspicuously exposed ventral to clypeal margin; Maxillary palpus elongate, reaching mesopleuron; Mandible broad and not twisted apically. Mandible upper tooth a little shorter than lower tooth in length; IOD about 0.41x as wide as MOD; Occipital carina complete. Mesoscutum with densely punctures, notaulus short; Scutellum carina absent; Pronotum spiracle partially coved; Epicnemial carina and prepectal carina complete; Posterior transverse carina of the mesosternum absent. Propodeum as figured (Fig. 3E). Propodeal spiracle nearly round shape. Legs slender, front tibial spur with a membranous flange. Tarsal claws pectinated. Forewing length 15 mm with Cu1 between 1m-cu and Cula 0.86x as long as Culb between 1A and Cu1a, Cu1 between Cua and 1m-cu 0.64x as long as abscissa of 1m-cu, maximum height of second discal cell about 0.54x as long as Cula between Cu1 and 2m-cu (Fig. 3G); Hind wing with 10 distal hamulus; Metasomal segment 1 with spiracle nearly middle. First tergite in dorsal view with anterior part slender, and posterior part wide. First tergite rather slender but broader apically, its spiracle colse middle and glymma absent. Abdomen laterally compressed; Ovipositor sheath about 0.1x as long as forewing.

Color. Face reddish brown; Antenna dark brown; Compound eye and ocelli black; Mandible reddish brown; Palpi reddish brown. Thorax reddish brown; Legs reddish brown. Abdomen reddish brown and black.

Measurements. BAI: 0.88, BI: 1.32, CI: 0.86, DAI: 0.95, DBI: 0.64, LAI: 1.05, NI: 0.38, PI: 1.01, RI: 2.03, TI: 2.24.

Distribution. Korea, China, Japan

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