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First Record of the Family Proctotrupidae (Hymenoptera: Proctotrupoidea) from Korea

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ABSTRACT

The family Proctotrupidae Latreille, 1802 is recorded for the first time in Korea. As a result of a taxonomic study of the Korean Proctotrupidae, two species *Disogmus areolator* and *Phaneroserphus calcar* are reported. A key to the species, redescriptions, and photographs for diagnostic characters are provided.

Key words: Proctotrupoidea, Proctotrupidae, *Disogmus areolator*, *Phaneroserphus calcar*, Korea

INTRODUCTION

The family Proctotrupidae is a large group, belongs to the superfamily Proctotrupoidea with a worldwide distribution. This family was named by Latreille (1802) based on the type genus *Proctotrupes*. Although about 352 proctotrupid species in 30 genera have been known (Townes et al., 1981; Johnson, 1992; Loiacono and Margaria, 2002), the actual proctotrupid fauna is estimated to be about 1,200 species around the world (Townes et al., 1981).

The Proctotrupidae is divided into two subfamilies, Austroserphinae and Proctotrupinae. Most genera and species belong to the subfamily Proctotrupinae. Members of the Austroserphinae, which has 4 species in 3 genera, are confined to the Australian region and southern South America. On the other hand, Proctotrupinae including remaining known species of the family prefer temperate and humid climate, and is most diverse in the Holarctic region (Townes et al., 1981).

Most species of the Proctotrupidae are endoparasitoids of coleopteran larvae living in soil litter and rotten wood, but some species of the genus *Fustiserphus* are parasitic on the larvae of the genus *Tingena* (Lepidoptera: Oecophoridae). Also, the genus *Phaneroserphus* was recorded as a parasite of a lithobiid centipede (Chilopoda) and two genera of Staphylinidae, and members of *Cryptoserphus* were known to be specialized parasites of larvae of the family Mycetophilidae (Diptera) (Newman, 1867; Early and Dugdale, 1994).

Proctotrupidae are characterized by combination of the following characters: antenna with 13 segments; forewing with costa, subcosta, and radius strong, and other veins nebulous; base of abdomen consisting of a solid stalk; abdominal sternites 1-4 and tergites 2-4 fused together to form a synsternite and syntergite; and ovipositor sheath rigid, exserted, and curved.

In this paper, we report *Disogmus areolator* (Haliday, 1839) and *Phaneroserphus calcar* (Haliday, 1839) belong to the subfamily Proctotrupinae for the first time in Korea. A key including generic characters, redescriptions, and photograph for diagnostic characters of the two species are provided.

MATERIALS AND METHODS

All the material used in this work have been collected by malaise trap (MT) and sweeping, and deposited in the Animal systematic laboratory of the Yeungnam University.

The morphological terminologies and characters used in this description follow those of Townes et al. (1981) and Yu et al. (2005). Specimens were examined with stereomicroscope (Stemi SV 11 Apo; Carl Zeiss, Göttingen, Germany) and field emission scanning electron microscope (S-4200; Hitachi, Tokyo, Japan). Key characters shown in photographs were produced with a Delta imaging system (*i*-Delta 2.6; iMTechnology, Daejeon, Korea).

Abbreviations for type information are as follows: TS, Type species; TL, Type Locality; TD, Type Depository. For Korean provinces: GW, Gangwon-do; CB, Chungcheongbuk-do; CN, Chungcheongnam-do; GB, Gyeongsangbuk-do. And for museums and institutions: BMNH, The Natural History Museum, London, UK; CASC, California Academy of Sciences, Francisco, CA; CNCI, Canadian National Collection of Insects, Ottawa, Canada; HNHM, Hungarian Natural History Museum, Budapest, Hungary; MNHN, Museum National d'Histoire Naturelle, Paris, France; MZLU, Museum of Zoology, Lund University, Lund, Sweden; NHMW, Naturhistorisches Museum, Vienna, Austria;

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NHRS, Naturhistoriska Riksmuseet, Stockholm, Sweden; NMID, National Meseum of Ireland, Dublin, Republic of Ireland; WHPC, Collection of Wolter Hellen; YNUE, Department of Biology, Yeungnam University, Gyeongsan, Korea.

TAXONOMIC ACCOUNTS

Order Hymenoptera
Superfamily Proctotrupoidea Latreille, 1802
Family Proctotrupidae Latreille, 1802

Key to the species of Proctotrupidae from Korea

1. Body reddish brown in female. Clypeus separated from face by distinct groove. Occipital carina incomplete. Notaulus reaching beyond center of mesoscutum. Costa about 0.5X as long as forewing. Intercubitus distinct. Fourth to sixth flagellar segments with tyloids in male ..... *Disogmus areolator* (Haliday)
- Body black in female. Clypeus not separated from face by distinct groove. Occipital carina complete. Notaulus absent. Costa longer than half as long as forewing. Intercubitus indistinct. Flagellar segments without tyloids in male ..... *Phaneroserphus calcar* (Haliday)

Genus *Disogmus* Foerster, 1856

Disogmus Foerster, 1856: 99. TS: *Proctotrupes areolator* Haliday.

Diagnosis. Cheek with a groove from eye to mandible. Occipital carina present only on upper part of head. Antennal flagellum with tyloids in male. Notaulus present and often reaching beyond center of mesoscutum. Intercubitus of forewing distinct and almost complete. Ovipositor sheath 0.75 to 0.90 as long as hind tibia.

***Disogmus areolator* (Haliday, 1839) (Fig. 1A-F)**

Proctotrupes areolator Haliday, 1839: 13. Type: male, female, TL: England (Dublin), TD: NMID.

Disogmus discrepator Foerster, 1856: 100. Type: male, TL: Germany, TD: Type lost.

Disogmus aequator Foerster, 1856: 100. Type: male, TL: Germany (Vienna), TD: NHMW.

Proctotrupes elegans Thomson, 1858: 414. Type: female, TL: Sweden (Ringsjö), TD: MZLU.

Proctotrupes nigripennis Thomson, 1858: 415. Type: male, TL: Sweden (Stockholm), TD: NHRS.

Disogmus canadensis Harrington, 1900: 193. Type: female, TL: Canada (Ottawa), TD: CNCI.

Disogmus diversicornis Kieffer, 1906: 271. Type: male, TL: USA (San Mateo), TD: Type lost.

Disogmus glabratus Kieffer, 1906: 273. Type: male, TL: USA (San Mateo), TD: CASC.

Disogmus carinatus Kieffer, 1907: 282. Type: male, TL: France (Paris), TD: MNHN.

Disogmus areolator ephippium Kieffer, 1907: 283. Type: male, female, TL: England (Dublin), TD: NMID.

Disogmus torvus Whittaker, 1930: 68. Type: male, female, TL: Canada (Chilliwack), TD: BMNH.

Redescription. Female: Body length about 2.8 to 3.0 mm (except ovipositor). Forewing length about 2.7 mm.

Color. Body reddish brown. Head black. Labrum, mandible, tegula, and antenna brown (darker apically). Maxillary palpus and legs light brown. Stigma and strong veins dark brown.

Head. Antenna with 11 flagellar segments. Scape in dorsal view about 1.8X as long as wide. Third flagellar segment about 2.1X as long as wide. Frons with sparse hairs, and between antennal sockets with moderately short longitudinal carina. Face with hairs. Clypeus separated from face by distinct groove, about 2.5X as wide as high, strongly convex, and its apical margin truncate. Labrum projecting conspicuously ventral to clypeal margin. Mandible with one tooth. Cheek with a groove from eye to mandible. Occipital carina present on upper part of head, but obsolescent ventrally. Compound eye with sparse hairs.

Thorax. Pronotum with strong epomia, and its dorsal apex projecting as tooth. Mesoscutum with sparse hairs. Notaulus slightly exceeding center of mesoscutum, usually shallow or sometimes faint or strong. Mesopleurum with epicnemial carina, median transverse groove, and sparse hairs except for its median part. Upper part of mesopleurum smooth or sometimes with fine wrinkles. Propodeum weakly rugose, with a median longitudinal carina and a posterior transverse carina. Each anterior lateral parts of propodeal dorsum with tooth-like projection. Posterior half of propodeum with hairs. Metapleurum rugose, with long and dense hairs except for anterior smooth part. Longer spur of hind tibia reaching to basal one-third of hind basitarsus.

Wing. Stigma of forewing about 3.0X as long as high. Costa about 0.5X as long as forewing. Radial vein arising from apical one-third of stigma.

Abdomen. Abdomen with a stalk that is about 1.2X as long as high. Anterior part of syntergite with 5-6 longitudinal grooves, the grooves interrupted at their mid length by a narrow smooth part. Ovipositor sheath 0.7X as long as hind tibia, smooth, slender, evenly curved, with sparse hairs that are denser near apex.

Male: Similar to female in general appearance except for following differences: Body black or blackish brown, base

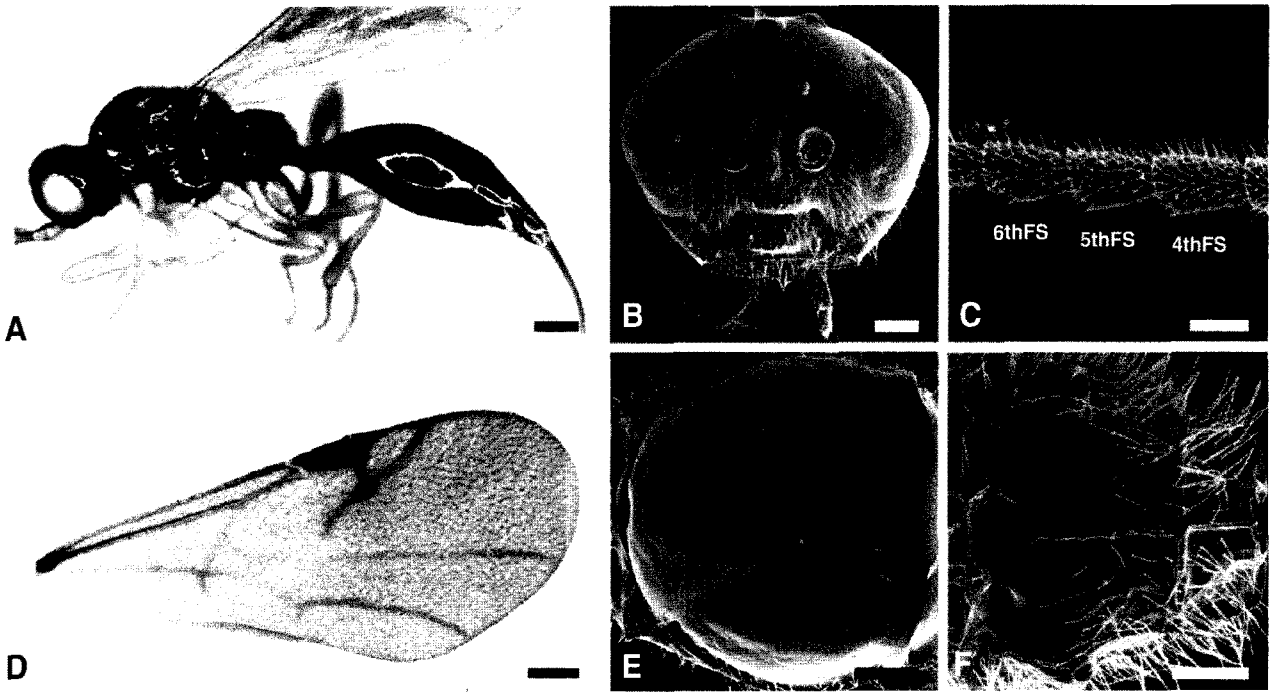

Fig. 1. *Disogmus areolator*. A, Body, lateral view; B, Head, frontal view; C, Fourth to sixth flagellar segments of male; D, Forewing; E, Mesoscutum; F, Propodeum. Scale bars=0.2 mm (A, D), 100 μm (B, C, E, F).

of hind coxa dark brown; fourth to sixth flagellar segments with tyloids.

Material examined (all the specimens collected with malaise trap): KOREA: 1♀, CB, Boeun-gun songnisan Beopjusa-maepyoso, (N36° 32′06″ E127° 49′40″), 4.VI.2007-11.VI.2007, (J.W. Lee); 2♂, CB, Danyang-gun Cheongdong-ri Sobaeksan bukbusa, (N36° 57′ E128° 26′), 19.IV.2006-24.V.2006, (J.W. Lee); 2♂, CN, Daejeon Dong-gu Daejeon Univ., (N36° 20′6″ E127° 27′38″), 15.VIII.2006-30.IX.2006, (J.W. Lee); 6♂, ditto, 12.IV.2007-12.V.2007, (J.W. Lee); 7♂, ditto, 12.V.2007-27.V.2007, (J.W. Lee); 1♀, ditto, 12.V.2007-27.V.2007, (J.W. Lee); 3♂, GB, Gyeongsansi Daedong Yeungnam Univ., (N35° 58′ E128° 47′), 13.V.2006-20.V.2006, (J.W. Lee).

Host records. Unknown.

Distribution. Ireland, England, Germany, Sweden, China, Korea.

Remarks. *D. areolator* is similar to *D. basalis* in its morphological characters but distinguished by following characters: fourth to sixth flagellar segments with tyloids in male and thorax generally reddish brown or fulvous in female.

Genus *Phaneroserphus* Pschorn-walcher, 1958

Phaneroserphus Pschorn-Walcher, 1958: 62. TS: *Proctotrupes calcar* Haliday.

Diagnosis. Head with a strong median vertical carina between antennal sockets. Occipital carina complete. Lower half of lateral aspect of syntergite without hairs. Longer spur of hind tibia in male curved, about 0.47 to 0.65 as long as hind basitarsus.

***Phaneroserphus calcar* (Haliday, 1839) (Fig. 2A-F)**

Proctotrupes calcar Haliday, 1839: 12. Type: male, female, TL: England (Dublin), TD: NMID.

Proctotrupes calcaratus Thomson, 1858: 419. Type: male, TL: Sweden (Stockholm), TD: NHRS.

Proctotrupes seticornis Thomson, 1858: 419. Type: male, female, TL: Sweden (Stockholm), TD: NHRS.

Serphus (*Phaenoserphus*) *calcar* var. *Transversalis* Kieffer, 1908: 306. Type: female, TL: France (Dieppe), TD: Type lost.

Serphus (*Phaenoserphus*) *calcar* var. *Areolatus* Kieffer, 1908: 306. Type: male, TL: France (Maisons-Laffitte), TD: MNHN.

Serphus (*Phaenoserphus*) *castaneus* Kieffer, 1908: 307. Type: female, TL: Czechoslovakia (Budapest), TD: HNHM.

Phaenoserphus calcar a. *nigrofemoratus* Hellén, 1941: 34. Type: male, TL: Finland, TD: WHPC.

Redescription. *Female*: Body length about 3.2 mm (except ovipositor). Forewing length about 2.4 mm.

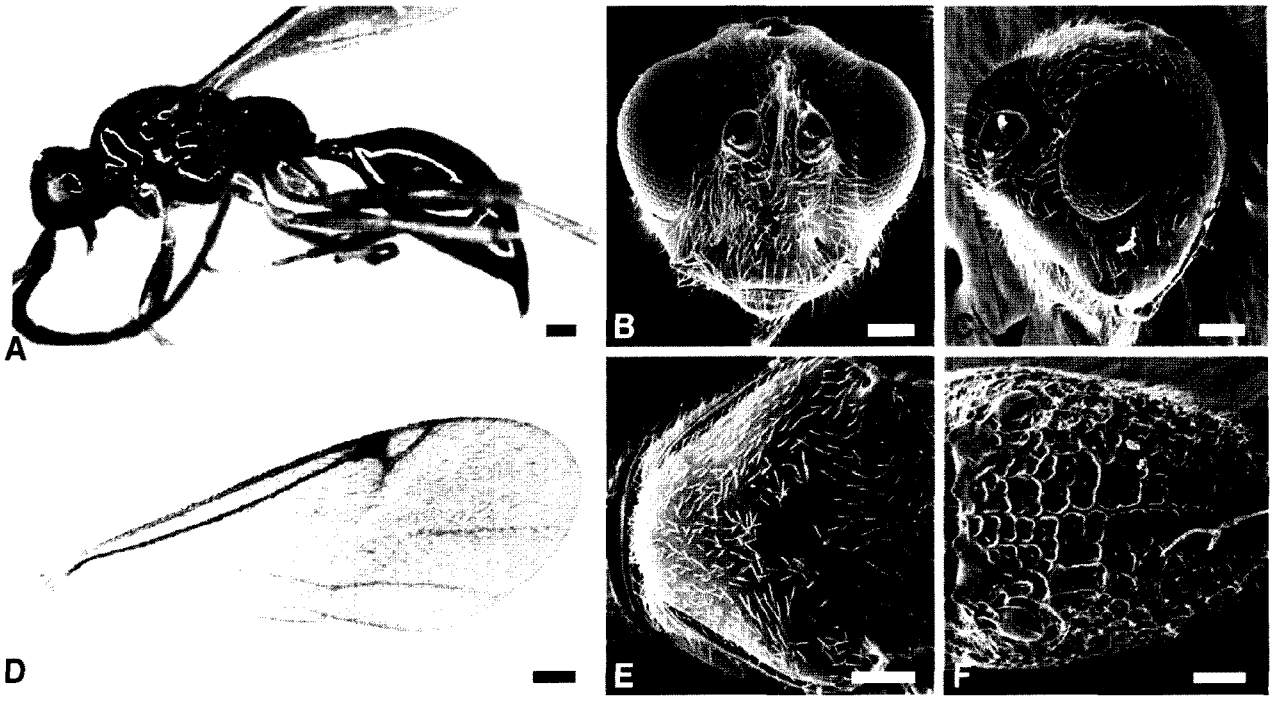

Fig. 2. *Phaneroserphus calcar*. A, Body, lateral view; B, Head, frontal view; C, Head, lateral view; D, Forewing; E, Mesoscutum; F, Propodeum. Scale bars=0.2 mm (A, D), 100 μm (B, C, E, F).

Color. Body black. Antenna, mandible, hind coxa apically, middle femur and hind femur brown. Labrum, maxillary palpus, tegula, and legs light brown. Stigma and strong veins dark brown.

Head. Antenna with 11 flagellar segments. Scape in dorsal view about 1.9X as long as wide. Second flagellar segment about 2.8X as long as wide. Frons between antennal sockets with very high median vertical carina and sparse hairs except for upper part of antennal sockets. Face with dense hairs. Clypeus not separated from face by distinct groove, about 2.6X as wide as high, its apical margin truncate. Labrum projecting conspicuously ventral to clypeal margin, its upper part with numerous transverse rugae. Mandible with one tooth. Cheek without a groove from eye to mandible. Occipital carina complete. Compound eye with rarely hairs.

Thorax. Pronotum smooth except for a week carina diverging from collar, with hairs anteriorly, near upper edge, and on hind corner, elsewhere hairless. Mesoscutum with dense hairs. Notaulus absent. Mesopleurum with median transverse groove and hairs below tegula, inner margin of speculum. Epicnemial carina distinct. Propodeum areolate-rugose, its upper part with median carina and a small smooth area near base on each side of median carina, the smooth area not reaching anterior edge of propodeal spiracle. Metapleurum areolate-rugose, its anterior part with a small smooth area. Longer spur of hind tibia about 0.47X as long as hind basitarsus. Tarsal claws simple.

Wing. Stigma of forewing about 2.0X as long as high. Costa longer than half as long as forewing.

Abdomen. Abdomen with a stalk that is about 1.1X as long as wide. Upper side of stalk with 4 transverse wrinkles. Lower half of syntergite with sparse hairs. Anterior part of syntergite with 2-3 longitudinal grooves on each side of median groove. Ovipositor sheath about 0.23X as long as hind tibia, weakly curved.

Male: similar to female in general appearance except for following differences: Second flagellar segment about 3.6X as long as wide; longer spur of hind tibia strongly curved, about 0.65X as long as hind basitarsus; upper side of stalk with 2 transverse wrinkles and a few punctures on its basal 0.4, the apical 0.6 with coarse longitudinal wrinkles, not punctuate.

Material examined (all the specimens collected with malaise trap): KOREA: 1♂, GW, Tebaeksan, (N37°42′4″ E128°54′39″), 15.VIII.1989, (J.W. Lee); 4♂, CN, Daejeon Dong-gu Daejeon Univ., (N36°20′6″ E127°27′38″), 01.V.2006-17.V.2006, (J.W. Lee); 1♀, ditto, 01.VII.2006-22.VII.2006, (J.W. Lee); 7♂, ditto, 01.VII.2006-22.VII.2006, (J.W. Lee); 27♂, ditto, 15.VIII.2006-30.IX.2006, (J.W. Lee).

Host records. *Bolitochara obliqua* (Coleoptera), *Quedius simplicifrons* (Coleoptera), *Lithobius forficatus* (Lithobiomorpha).

Distribution. Ireland, Scotland, England, Spain, France,

Norway, Sweden, Denmark, Germany, Italy, Austria, Finland, Turkey, Russia, Korea.

Remarks. P. calcar is distinguished from other species belonging to the genus *Phaneroserphus* by following characters: head projecting forward from eye only a short distance in lateral view and second flagellar segment about 2.8X as long as wide.

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