

First Record of the Genus *Probolus* (Hymenoptera: Ichneumonidae: Ichneumoninae) from Korea, Based on One New Species and One Newly Recorded Species

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ABSTRACT

An ichneumonine genus, *Probolus* Wesmael, is first reported from Korea with *P. fukuchiyamanus* Uchida and *P. cyanogaster* Jeong. The former is new to Korea and the latter new to science. A key to the two species, and their descriptions and photographs of diagnostic characters are provided.

Key words: *Probolus*, *fukuchiyamanus*, *cyanogaster*, Ichneumonidae, Korea

INTRODUCTION

The genus *Probolus* Wesmael placed in the tribe Ichneumonini contains 11 extant species worldwide. Of these, four species has been known to occur in eastern Palaearctic region, and the others in western Palaearctic, Oriental and Nearctic regions (Yu and Horstmann, 1997). Some species of the *Probolus* Wesmael were known to be specialized parasitoids of larvae of Arctiidae and Noctuidae (Lepidoptera).

The genus *Probolus* is similar to the genus *Ctenichneumon* Thomson, but mostly distinguished by key characters of the obsolete carination on propodeum, irregularly wrinkled postpetiole and absence of median field of postpetiole. Although some authors has been recognized as a member of the tribe Eurylabini based on the characters of propodeum and postpetiole (Townes, 1944; Townes and Townes, 1951), Heinrich (1962) suggested that both characters are cases of convergence and all other characters fall in the features of the tribe Ichneumonini than the tribe Eurylabini. The Heinrich concept was recently prevailed as shown in Townes et al. (1965) and Yu and Horstmann (1997), and is adopted in this study.

In the present study, we report two species of the *Probolus* Wesmael newly discovered in Korea: *P. fukuchiyamanus* Uchida and *P. cyanogaster* Jeong new species. The former is new to Korean fauna, and the latter is new to science. The key to the two species, and description and photographs of diagnostic characters for each species is provided.

MATERIALS AND METHODS

Materials used in this work have been collected by malaise trap (MT) and sweeping, and deposited in Animal systematics laboratory of the Yeungnam University (YNUE, Daegu, Korea). Holotype of *P. fukuchiyamanus* were loaned from the Systematic Entomology Laboratory, Hokkaido University, Japan. The comparison between the holotype and Korean specimens is made.

Official provincial names are abbreviated as follows: GG, Gyeonggi-do; GW, Gangweon-do; CB, Chungcheongbuk-do; CN, Chungcheongnam-do; GB, Gyeongsangbuk-do; GN, Gyeongsangnam-do; JB, Jeollabuk-do; JN, Jeollanam-do. Museums and institutions- SEHU, Entomological Institute, Faculty of Agriculture, Hokkaido University, Sapporo, Japan.

TAXONOMIC ACCOUNTS

Order Hymenoptera

Family Ichneumonidae Latreille, 1802

Subfamily Ichneumoninae Latreille, 1802

Tribe Ichneumonini Latreille, 1802

¹*Genus *Probolus* Wesmael, 1845

Probolus Wesmael, 1845, p. 150. Type Species: *Ichneumon culpatorius* Linnaeus, 1758.

Key to the species of the genus *Probolus* in Korea

1. Mesonotum and mesopleura with yellowish marks; metapleura with confluent punctures, without rugae; pleural carinae complete; juxtacoxal carinae completely absent

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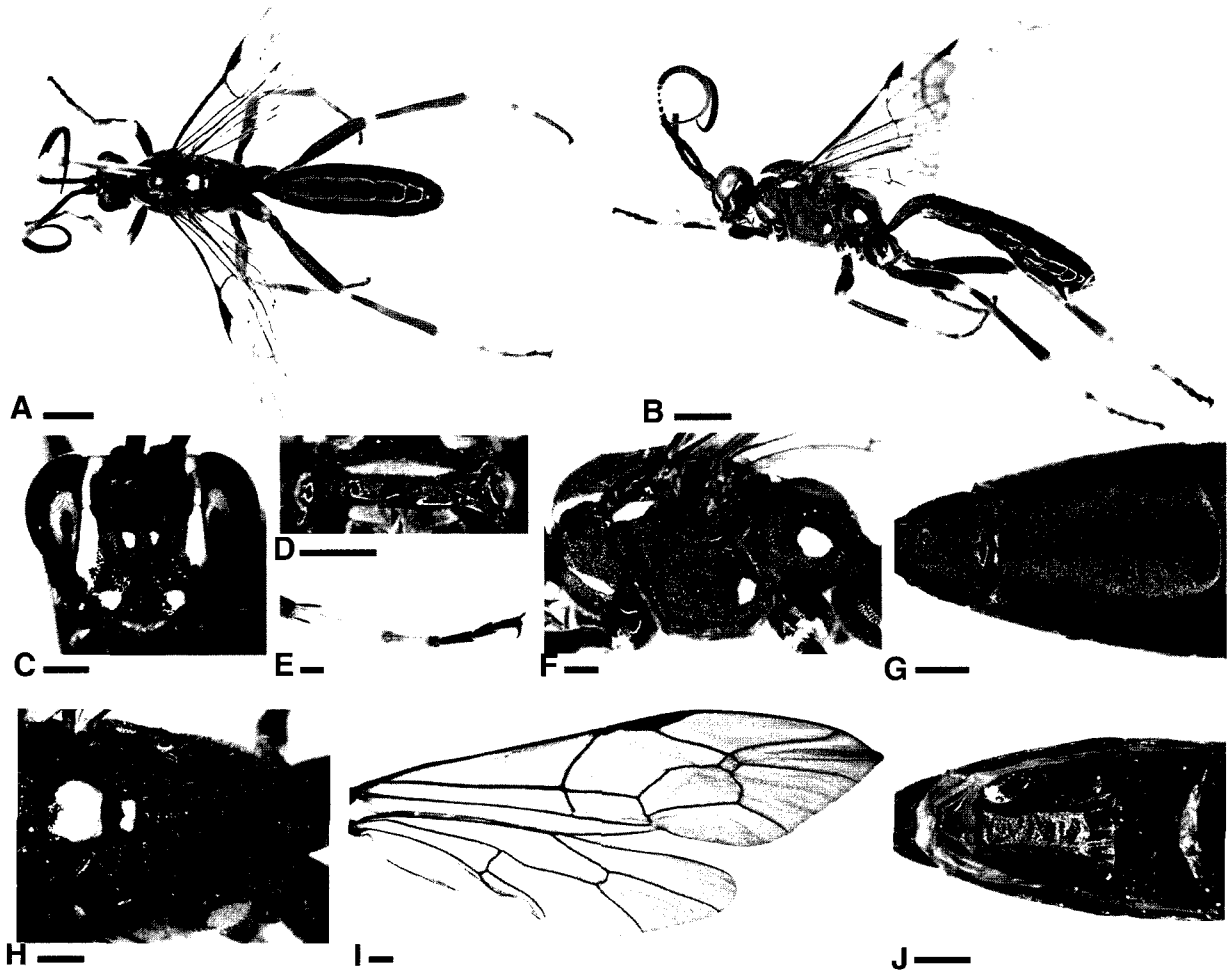


Fig. 1. *P. cyanogaster* n. sp., ♀. (A-B) General habitus: (A) in dorsal view. (B) Body in lateral view. (C) Head in frontal view. (D) Mandible. (E) Hind tarsus. (F) Mesosoma in lateral view. (G) Postpetiole and 2nd tergite. (H) Scutellum and Propodeum. (I) Wings. (J) 2nd and 3rd sternites. Scale bars=2.0 mm (A, B), 0.5 mm (C-J).

(Fig. 1F). Metanotum polished blue. Flagella of male without tyloids *P. cyanogaster* n. sp.
 – Mesonotum and mesopleura without marks; metapleura rugosopunctate; pleural carinae incomplete posteriorly; juxtacoxal carinae ambiguously present. Metanotum polished black. Flagella of male with tyloids
 *P. fukuchiyamanus*

¹Probolus cyanogaster* Jeong n. sp. (Figs. 1, 2)**

Female. Body length 15 mm. Forewing length 12 mm.

Color. Ground color of body black. Flagella with a median white band. Inner margin of eye, lateral area of clypeus, ventral marks of genae, margin of temple, and labrum yellow. Pronotal flange, dorsal and ventral margins of pronotum,

mark of mesonotum, scutellum, postscutellum, and marks of meso- and metapleura yellow. Apexes of all coxae and fore femora, and ventral areas of tibiae yellow, tarsi brown; ventral areas of mid tibiae and basitarsi yellow; basal and median areas of hind tibiae, and 1-2 tarsomeres yellow. Wings light brown, stigma dark brown. Metasoma polished blue; apical margins of tergites 7-8 yellowish brown. Sternite 2 brown with polished blue mediolateral area.

Flagella. Flagella with 45 segments, lanceolate; lanceolar flagellomeres transverse, 2.0X as wide as long; the third flagellomere about 2.0X as long as wide.

Head (Fig. 1C). Vertex with posterior section weakly and evenly rounded down to occipital carina, 1.2X as long as ocellar area. Genae convex, evenly receding behind eye in dorsal view, 0.8X as wide as eye in lateral view. Juncture of

¹*노랑무늬흑뿌리맷시벌

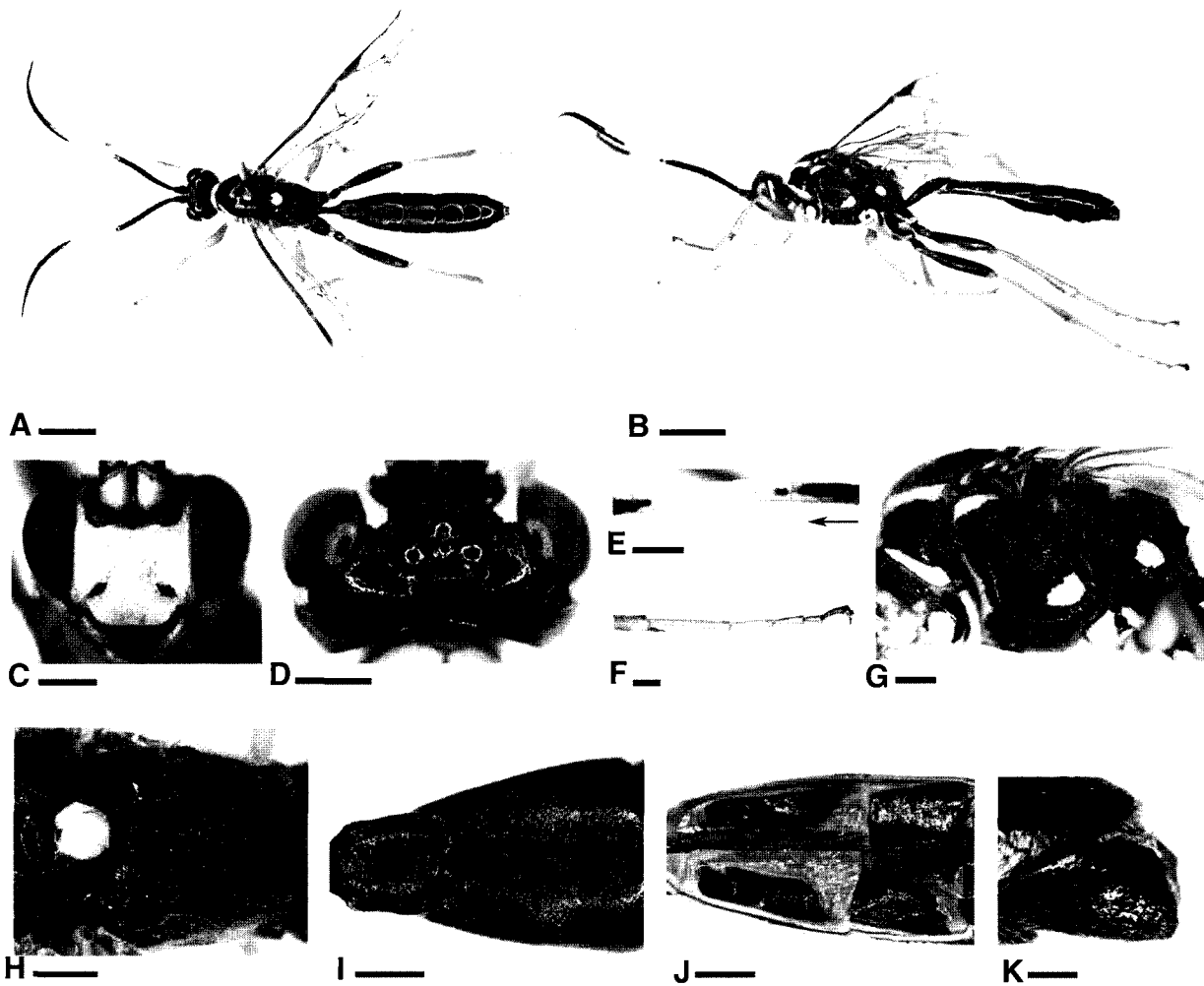


Fig. 2. *P. cyanogaster* n. sp., ♂. (A-B) General habitus: (A) Body in dorsal view. (B) Body in lateral view. (C) Head in frontal view. (D) Head in dorsal view. (E) Flagellomeres 8-15. (F) Hind tarsus. (G) Mesosoma in lateral view. (H) Scutellum and Propodeum. (I) Postpetiole and 2nd tergite. (J) 2nd and 3rd sternites. (K) Genital clasper. Scale bars=2.0 mm (A, B), 0.5 mm (C-J) and 0.2 mm (K).

hypostomal and occipital carinae separated from mandibular base by 1.0X basal mandibular width. Ocellar area convex, supra-antennal area medially simple, with transverse rugae. Distance between eye and antennal socket narrower than distance between antennal sockets. Supra-clypeal area simply convex, with a median swelling. Clypeus basally slightly swollen then slightly concave apically. Clypeus about 2.0X as wide as long, sparsely and irregularly punctate; apical margin simple, without a median apical tubercle, apicolateral margin forming an angle of approximately 40°. Malar space with subocular sulcus, moderately long, 0.8X basal mandibular width. Mandible moderately large, but evenly tapered (Fig. 1D).

Mesosoma (Figs. 1F, H). Pronotum in profile moderately long, 0.8X as long as deep; epomia strong. Mesoscutum finely punctate; notauli distinct. Scutellum weakly convex;

lateral longitudinal carinae more or less complete to center. Mesopleura posteriorly concave, with rugosopunctate; epicnemial carinae complete, turned anteriorly to touch anterior mesopleural margin. Propodeum short, with short apophyses; propodeal spiracles elongate oval, more than 3.0X as long as wide. Areola ambiguous, with irregular rugae. Metapleura with confluent punctures, rugae absent; pleural carinae complete; juxtacoxal carinae absent.

Legs. Hind femora ventrally simple, with at most a few scattered fine bristles; tarsal claws simply pointed (Fig. 1E).

Wings (Fig. 1I). 2 m-cu of fore wing with two bullae separated by an abscissa of the vein that is longer than either bulla; Cell 1+2Rs (areolet) anteriorly pointed, vein 2Rs as long as vein 3r-m, vein 2 m-cu interception at midpoint of posterior margin. Vein 2-CU of hind wing 2.0X as long as vein CU-a.

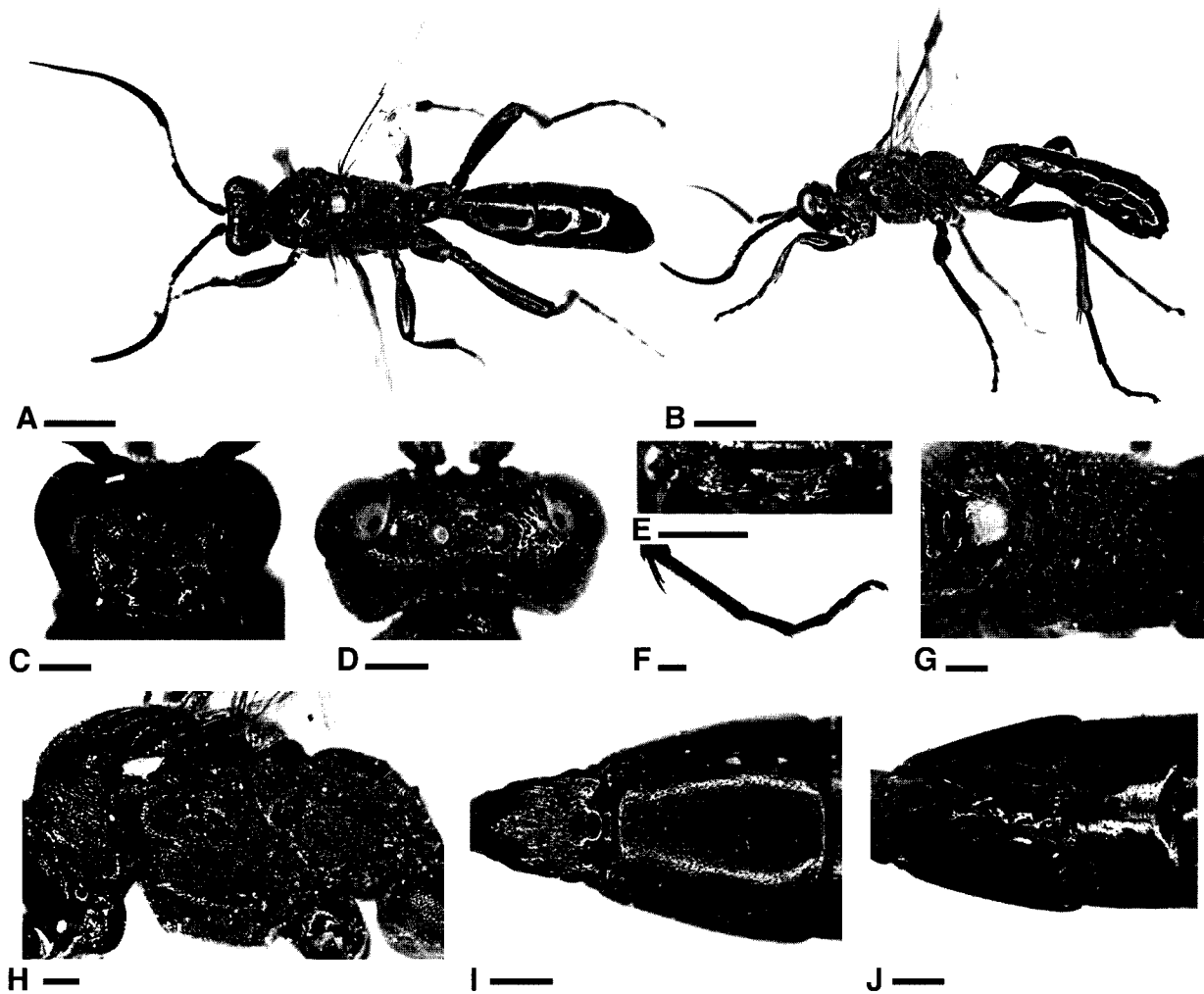


Fig. 3. *P. fukuchiyamanus*, ♀. (A-B) General habitus: (A) Body in dorsal view. (B) Body in lateral view. (C) Head in frontal view. (D) Head in dorsal view. (E) Mandible. (F) Hind tarsus. (G) Scutellum and Propodeum. (H) Mesosoma in lateral view. (I) Postpetiole and 2nd tergite. (J) 2nd and 3rd sternites. Scale bars=2.0 mm (A, B), 0.5 mm (C-J).

Metasoma (Figs. 1G, J). Median longitudinal carinae of first tergite absent on postpetiole. Postpetiole without distinct median field, with weak transverse rugae. Gastrocoeli indistinct, 0.2X as broad as distance between them, and with weakly impressed thyridiae. Second tergite 1.4X as long as width of its apex, third tergite as long as width of its apex. Tergites 2-4 aciculated transversely (Fig. 1G). Sternite 2 divided, sternites 3-5 entire (Fig. 1J). Hypopygium elongate, exposing only apex of ovipositor (amblypygous) (Fig. 1B).

Male. As in female except following characters:

Body length 12-15 mm. Forewing length 10-12 mm.

Color. Flagella with or without a median white band. Margin of eye except vertex area, supra-clypeal area, clypeus, ventral areas of genae, labrum, mandible with dark brown apex, and maxillary and labial palps yellow. Margin of pro-

notum, mark of mesonotum, ventral areas of mesopleura, scutellum, postscutellum, and marks of metapleura yellow. Fore and mid legs brown; coxae and trochanters, and ventral areas of femora yellow. Hind legs dark brown; apices of coxae, outer areas of trochanters, ventral areas of femora, and apices of tibiae yellow. Wings clear, stigma brown. Apical margin of tergite 7 yellow. Sternites 2-3 yellowish brown with polished blue mediolateral area; apical margins of sternites 4-6 yellow.

Flagella. Flagella with 39 segments, without tyloids (Fig. 2E), with third flagellomere about 2.5X as long as wide, central flagellomeres elongate.

Metasoma. Second tergite 2.0X as long as width of its apex (Fig. 2I), third tergite 1.2X as long as width of its apex. Sternites 2-3 divided (Fig. 2J), sternites 4-5 entire.

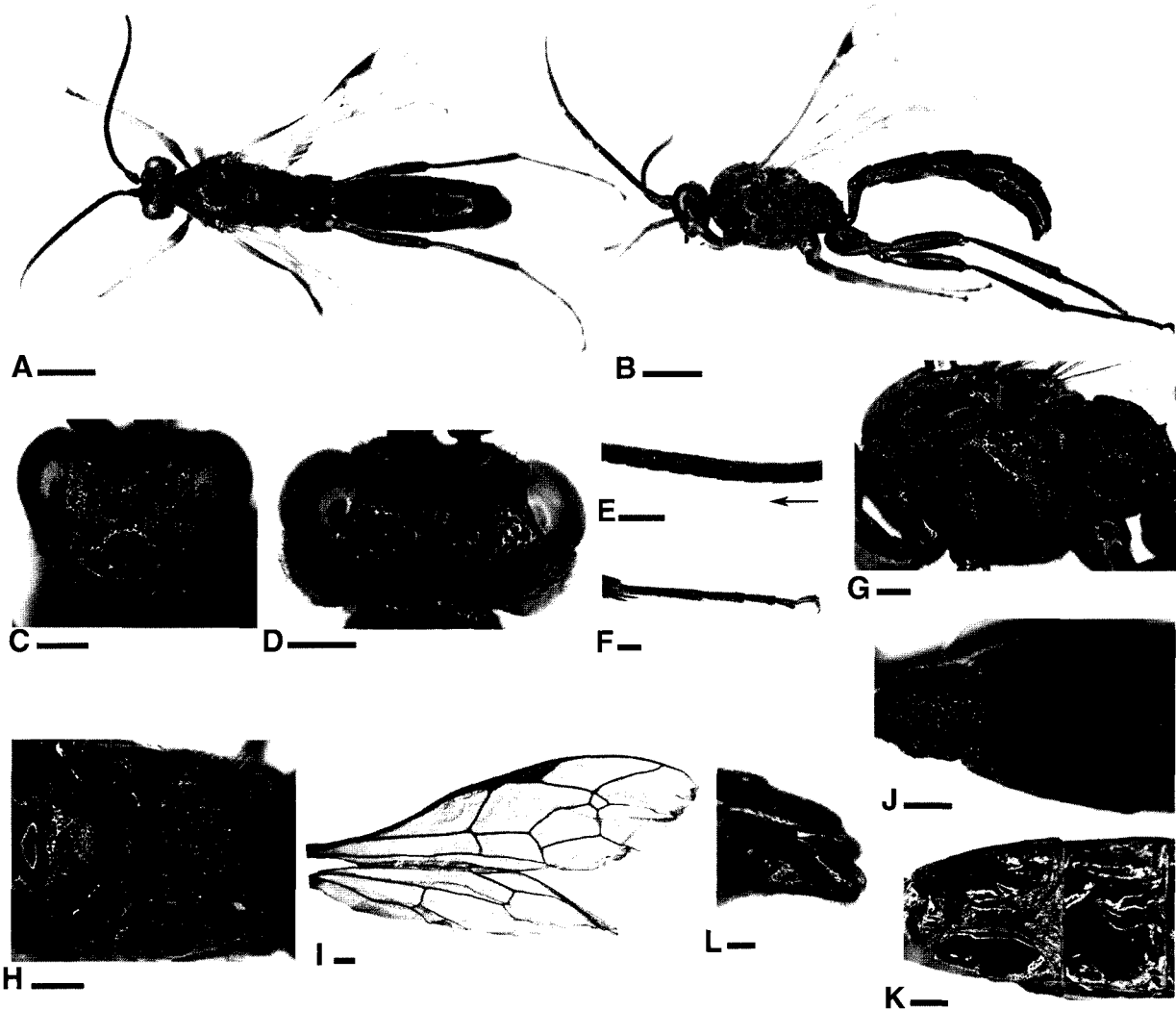


Fig. 4. *P. fukuchiyamanus*, ♂. (A-B) General habitus: (A) Body in dorsal view. (B) Body in lateral view. (C) Head in frontal view. (D) Head in dorsal view. (E) Flagellomeres 7-14. (F) Hind tarsus. (G) Mesosoma in lateral view. (H) Scutellum and Propodeum. (I) Wings. (J) Postpetiole and 2nd tergite. (K) 2nd and 3rd sternites. (L) Genital clasper. Scale bars=2.0 mm (A, B), 0.5 mm (C-K) and 0.2 mm (L).

Genital clasper enlarged; ventral apical corner more pointed than dorsal apical corner (Fig. 2K).

Material examined. Type series (all the types is housed in YNUE). Holotype: ♀, KOREA: GW, Donghae-si, Samhwa-dong, Mureung valley, 10 Oct 2007 (J.W. Lee), by Malaise trap. Allotype: ♂, the same data as Holotype. Paratype: 1 ♀ 1 ♂, KOREA: Seoul, Korea Univ., forestry experiment station D, 29 May 1987 (J.W. Lee); 1 ♀, Seongbuk-gu, Cheonmasan, 26 May 1995 (S.Y. Jeong); 1 ♀, GG, Namhansanseong, 29 May 1982 (H.K. Lee); 1 ♂, GG, Cheonmasan, 13 Jun. 1981 (I.H. Lee); 1 ♀, CB, Okcheon-gun, Gunbuk-myeon, 16 May 1994 (Y.J. Cho); 1 ♂, Danyang-gun, Sobaeksan, 25 May 1996 (H.J. Kim); 1 ♂, GB, Joryeongsan, 17 May 2002

(E.M. Gwon). General specimens: 1 ♂, Daejeon, Daejeon Univ., 13-28 Apr. 2006 (J.W. Lee), by Malaise trap; 1 ♀, 1-18 May 2006 (J.W. Lee), by Malaise trap; 1 ♂, Danyang-gun, Sobaeksan, Namcheon, 26 Apr.-25 May 2006 (J.W. Lee), by Malaise trap; 1 ♀, GN, Yangsan, Wonhyosan, Naeweonsa, 19 May 2002 (J.C. Jeong).

Distribution. Korea.

Etymology. The specific epithet of this species refers to the color of metasoma.

Remarks. This species can be distinguished by the following combination of characters: mesosoma with yellowish marks; postpetiole and 2nd tergite transversely aciculate; metasoma polished bronzy.

¹**Probolus fukuchiyamanus* Uchida, 1927 (Figs. 3, 4)

Probolus fukuchiyamanus Uchida, 1927, p. 210, ♀, Kyoto, Japan (System. Entomol. Lab., Hokkaido Univ., Japan); Uchida, 1935: 30; Townes, Momoi & Townes, 1965: 509; Yu & Horstmann, 1997: 640.

Probolus culpatorius f. *fukuchiyamanus*: Uchida, 1936: 141.

Probolus culpatorius fukuchiyamanus: Uchida, 1953: 127; Iwata, 1958: 72; 1960: 141.

Female. Body length 15 mm. Forewing length 12 mm.

Color. Ground color of Body black: dorsal areas of 6-10 flagellomeres, dorsal and posterior margins of compound eyes, subalar prominences and scutellum yellow; ventral areas of fore tibiae light brown.

Flagellum. Flagellum with 39 segments; flagellomere 3 about 1.5X as long as wide; central flagellomeres lanceolate, 1.2X as wide as long.

Head (Figs. 3C, D). Vertex with posterior section steeply declivous behind ocelli but surface flat. Genae weakly convex, evenly receding behind eye in dorsal view, as wide as eye in lateral view. Juncture of hypostomal and occipital carinae separated from mandibular base by about 0.4X basal mandibular width. Occipital carina complete, and dorsal and ventral regions with same height. Distance between median and lateral ocellus as long as diameter of median ocellus, area between lateral ocellus and eye sparsely punctate. Ocellar area weakly convex, supra-antennal area medially simple, densely punctate. Distance between eye and antennal socket narrower than distance between antennal sockets. Inner margin of eye weakly concave opposite antennal socket. Supra-clypeal area simply convex, densely punctate, with a weak median swelling and a large tubercle between antennal sockets. Clypeus weakly but evenly convex, simply transverse, 2.0X as wide as long, with thinned apical margin; apical margin simple, without a apical tubercle, apicolateral margin forming an angle of approximately 40°. Malar space without subocular sulcus, as long as basal mandibular width. Mandible moderately large, weakly and evenly tapered; axis of mandible not twisted.

Mesosoma (Figs. 3G, H). Pronotum in profile moderately long, 0.8X as long as deep; epomiae short, forming a weak ridge shaped. Mesoscutum finely punctate and polished, notauli absent. Scutellum weakly convex; lateral longitudinal carinae absent. Mesopleura densely and closely punctate, with a weak diagonal impression delineating a convex area posterodorsally; epicnemial carinae complete, turned anteriorly to touch anterior mesopleural margin; postscutellum evenly convex, axillary trough of metanotum with

reduced longitudinal carinae. Propodeum elongated, with irregular rugae and short apophyses. Propodeal spiracles subcircular, about 1.5X as long as wide. Areola ambiguous, with irregular rugae. Metapleura rugosopunctate; pleural carinae incomplete posteriorly; juxtacoxal carinae ambiguously present.

Legs (Fig. 3F). Simple. Hind coxa without scopa, tarsal claws simply pointed.

Wings (Fig. 4I). 2m-cu of fore wing with a single bulla; Cell 1+2Rs (areolet) anteriorly truncate, vein 2/Rs as long as 3r-m, vein 2m-cu interception at midpoint of posterior margin. Distal abscissa of Cu tubular, vein 2-CU 4.0X as long as vein CU-a.

Metasoma (Figs. 3I, J). Median longitudinal carinae of first tergite absent. Postpetiole without distinct median field, with longitudinal rugae and sparse puncture. Gastrocoeli small, thyridiae absent. Tergites polished, with fine and sparse punctures (Fig. 3I). Sternite 2 divided, sternites 3-5 entire (Fig. 3J). Hypopygium elongate, exposing only apex of ovipositor (amblypygous) (Fig. 3B).

Male. As in female except for the following differences:

Flagella. Flagellomeres 7-14 with tyloids, central flagellomeres elongate (Fig. 4E).

Metasoma. Genital clasper enlarged; ventral apical corner more pointed than dorsal apical corner (Fig. 4L).

Material examined. [YNUE] KOREA: 1 ♂, GB, Cheongdo-gun, Unmunsa, 24 May. 1987 (J.W. Lee); 2 ♀, Gyeongsangsi, Yeungnam Univ., 4 Sep. 1988 (J.W. Lee); 1 ♀, 24 May. 1990 (J.H. Kim); JAPAN: 1 ♀, Hyogo, Fukuchiyama, 1925 (Fukuda), Holotype of *Probolus fukuchiyamanus* Uchida, 1927.

Distribution. Korea, India, Japan, Far eastern Russia (Sakhalin), Taiwan.

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