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Taxonomic Study on the Poneromorph Subfamilies Group (Hymenoptera: Formicidae) in Korea

Dongpyeo Lyu*

Department of Forestry, Sangji University, Wonju-shi, Gangwon-do 220-702, Korea

한국산 침개미아과군의 분류학적 연구

류동표*

상지대학교 생명자원과학대학 산림과학과

ABSTRACT : A total of 12 species in six genera of the poneromorph subfamilies group in Korea was reviewed. All investigated specimens are classified into three subfamilies; Amblyoponinae, Proceratinae and Ponerinae. Totally six genera were known and *Cryptopone*, *Hypoponera*, *Pachycondyla* and *Ponera* belong to the subfamily Ponerinae and *Amblyopone* and *Proceratium* belongs to the subfamily Amblyoponinae and Proceratinae respectively. In this study, keys to the all known genera and species of the subfamilies in Korea are presented. A synonymic list, description of a worker and comments on each species are given with SEM photographs of worker.

KEY WORDS : Amblyoponinae, Ponerinae, Proceratinae, Formicidae, Taxonomy, Poneromorph Subfamilies Group, Korea

초 록 : 한국산 침개미형아과군에 6속 12종을 분류학적으로 재검토하였다. 조사된 표본들은 3아과로 톱니침개미아과, 배굽은침개미아과, 침개미아과로 분류되었다. 6속중에서 *Cryptopone*, *Hypoponera*, *Pachycondyla*와 *Ponera*이 침개미아과에 속하고 *Amblyopone*와 *Proceratium*은 각각 톱니침개미아과와 배굽은침개미아과에 속한다. 본 연구에서 한국산 속 및 종 검색표를 제시하였다. 12종의 일개미의 외부형태적 특징과 간략한 기술을 일개미의 전자현미경사진과 함께 도해하였다.

검색어 : 톱니침개미아과, 침개미아과, 배굽은침개미아과, 개미과, 분류학, 침개미아과군, 한국

Korea is currently known to have 135 described species and subspecies, 39 genera and 7 subfamilies. Among them, there are three families that belong to the poneromorph group and they are Amblyoponinae, Ponerinae and Proceratinae. The poneromorph group represented by Ponerinae shares some mophological similarities, such as gaster with a slight but distinct impression between the first and second segments. In some cases (species of Proceratiinae) the gaster is highly modified and the impression is weak or essentially absent, but in these the tip of the gaster is directed downwards and located along the lower surface of the body. In a few other cases the gaster is smooth and uniform, but here the mandibles are elongate and straight, with teeth only at the extreme tip, and

*Corresponding author. E-mail: myrmicinae@sangji.ac.kr

attached close together along the front margin of the head. The upper surface of the tip of the gaster (the pygidium) is rounded and lacks a row of spines or teeth on its outer and trailing edge. The sting is present.

Species of poneromorph group range from small and cryptic to large and conspicuous. They are found throughout Korea from pristine habitats to disturbed sites such as forests and parks, and can be quite abundant. There are predacious, generally forage on the ground, and some specialise on a very limited range of prey.

Materials and Methods

The specimens examined in this study were collected by leaf-litter extractions using Berlese funnel, aspirator and/or sweeping net. A total of about 3,500 specimens were examined and most of them were collected from 1993 to 2002. A part of specimens as based on the clollection by Dr. B.M. Choi at Cheongju Education University and Dr. D.P. Lyu at Sangji University. The Korean specimens recorded previously by Collingwood (1976, 1981) were borrowed from Dr. Kupyanskaya, Far Eastern Branch of the Institute of Biology and Soil Sciences Russian Academy of Science, Vladivostok.

The specimens belong to the Ponerinae was detected during the process of plant quarantine from 1996 to 2007 and those specimens preserving in National Plant Quarantine Service were inspected.

The provincial abbreviations for the collection sites used here are as follows:

GG	Gyeonggi-do
GW	Gangwon-do
CB	Chungcheongbuk-do
CN	Chungcheongnam-do
JB	Jeollabuk-do
JN	Jeollanam-do
GB	Gyeongsangbuk-do
GN	Gyeongsangnam-do
JJ	Jeju-do
HH	Hwanghaedo

Systematics

The PONEROMORPH SUBFAMILIES GROUP include Subfamilies Amblyoponinae, Ectatomminae, Heteroponerinae, Paraponerinae, Ponerinae and Proceratiinae.

Diagnosis

Orifice of metapleural gland is never concealed by a dorsally located cuticular flange or flap. Propodeal lobes present. Waist of one segment (petiole) that is separated posteriorly from abdominal segment III (first gastral) at least by a constriction (note 1). Helcium sternite retracted, overlapped by the tergite (note 2) (also in male). Abdominal segment IV with presclerites and usually a girdling constriction present between the presclerites and postsclerites (note 4) (also in male). Spiracles of abdominal segments V − VII are concealed by posterior margins of preceding tergites. Sting present, usually strongly developed.

Notes

(1) In almost all poneromorphs abdominal segment III varies from slightly larger than IV to slightly smaller than IV. However, in Paraponerini and a few species of Proceratiini segment III is markedly reduced with respect to IV and may be termed sub-postpetiolate. See also notes under myrmicomorphs.

(2) Helcium sternite is convex and not overlapped by the tergite only in *Discothyrea* (Proceratiini). In this respect Discothyrea resembles the dorylomorphs but otherwise their morphologies are very different; the similarity of the helcium is presumed to be by convergence.

(3) For distribution of tergosternal fusion of abdominal segment III throughout the family see under dorylomorphs (note 3). Of all the poneromorphs only the monotypic Malagasy amblyoponine genus *Adetomyrma* lacks tergosternal fusion on abdominal segments III and IV. Whether this is plesiomorphec or a reversal from a previously fused state remains under debate (see discussion in Ward, 1994). It is by no means definite that tergosternal fusion of abdominal segment IV represents a poneromorph synapomorphy. Outside

the poneromorphs this fusion is restricted to *Tatuidris* (Agroecomyrmecini) and *Ankylomyrma* (Ankylomyrmini).

(4) The girdling constriction is usually apparent but in the amblyoponine *Adetomyrma* sharply differentiated presclerites are absent on abdominal segment IV. In Ponerini the character is variously reduced or lost in such genera as *Asphinctopone* and *Phrynoponera*, and in some individual species or species groups within larger genera such as *Leptogenys*, *Anochetus Odontomachus*, *Pachycondyla*, and also in *Simopelta*.

Key to the subfamilies of Poneromorph Subfamilies Group in Korea

1. First or second gastric tergum swollen, so that the gaster strongly curved ventrally and its apex turned forward; mandibles with 3 or more teeth; clypeus not extending forward and with the rear part of the mandibles visible when they are closed ····· **Proceratinae**
- First and second gastric terga not swollen, the gaster not strongly curved ventrally; tips of the mandibles with a single distinct, sharp tooth; setae on head and body long, thin and tapering to points ····· 2
2. Connection between petiole and gaster broad; petiole without posterior face; anterior margin of clypeus dentate Tibiae of the hind legs with large comb-like spurs; Tooth at the tip of the mandibles no more than twice as long as the next longest tooth ····· **Amblyoponinae**
- Connection between petiole and gaster narrow; petiole with posterior face; anterior margin of clvpeus not dentate ····· **Ponerinae**

Subfamily Amblyoponinae

Genus *Amblyopone* Erichson, 1842

Amblyopone Erichson, 1842, *Archiv für Naturgeschichte* 8: 260.

Type species: *Amblyopone australis* Erichson, 1842: 261, by monotypy.

Diagnosis. Elongated mandibles, pointed at the apex, but not as long as the head, and the tooth row on the inner margin single. Finely sculptured.

Biology. Species of *Amblyopone* can be locally common and are regularly encountered. They nest in soil under rocks or logs or in rotten wood. Nests often lack large central chambers and instead are composed of many small satellite nests, consisting of a few workers together with a small amount of brood, dispersed over a small area. Workers are cryptic predators in soil and leaf litter and are seldom seen foraging on the surface of the ground. Some species show a strong preference for centipedes while others will feed on a range of soft-bodied arthropods. When disturbed they will move slowly underground or remain motionless.

1. *Amblyopone silvestrii* (Wheeler, 1928) 톱니침개미

Amblyopone silvestrii: Brown, 1960, 122: 169; Choi, 1986: 297; Kim *et al*., 1989: 217; Terayama, 1989: 345; Terayama *et al*., 1992: 22; Choi & Bang, 1993: 321;

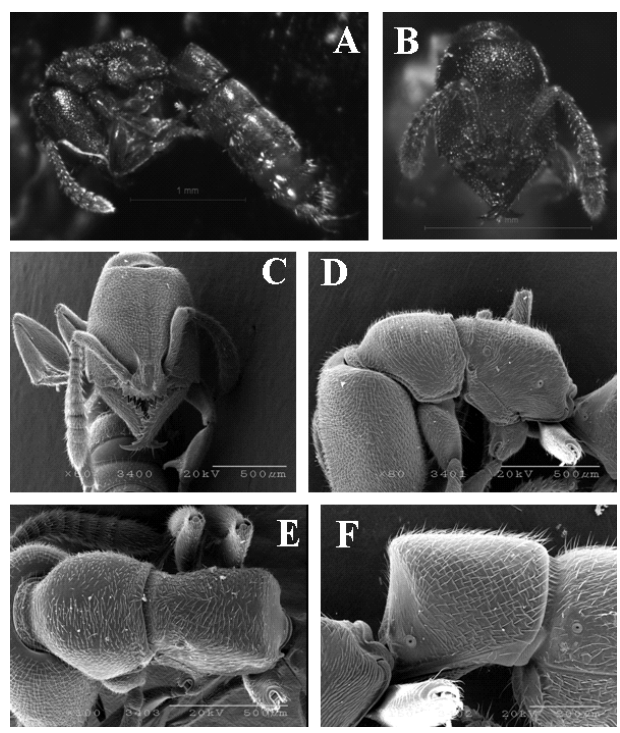

Fig. 1. *Amblyopone silvestrii* (Wheeler, W.M.) : A. Lateral view of worker; B. Head, frontal view; C. Portion of antennal insertion; D. Mesosoma, dorsal view; E. Mesosoma, lateral view; F. Petiolar node, lateral view.

Choi *et al*., 1993: 347; Kim *et al*., 1993: 118; Masuko, 1993: 35; Kim *et al*., 1994: 294; Choi & Lee, 1995: 193; Choi, 1996b: 12; Choi, 1996c: 46; Kim, 1996: 170; Choi, 1997b: 125; Choi, 1998: 217; Choi & Park, 1998: 59.

Worker. Total length of workers around 3.5 - 4.5 mm. Body color yellowish brown to reddish brown. Amblyopone species distinguished from the rest by its 12-segmented antennae and mandibular dentition, with numerous denticles double-ranked denticles. The frontal lobes cover the antennal insertions and are well separated.

Specimens examined. **[GW]** 7w, Mt. Chiaksan, 21. VI. 1998 (B.M. Choi). **[GG]** 1w, Mt. Dobong-san, 4w. VI. 2001 (D.P. Lyu); 4w. Is. Baengnyeongdo, 16. VI. 1995 (I.H. Lee). **[CB]** 22w, Koesan, 21. VIII. 2001 (D.P. Lyu); 2w Mt. Mankunsan, 5. IX. 1996 (B.M. Choi). **[JB]** 10w, Is. Seonyudo, 22. IV. 1993 (B.M. Choi). **[JN]** 5w, Is. Soheuksando, 26. IV. 1994 (I.H. Lee). **[GN]** 2w, Is. Hansando, 31. V. 1988 (B.M. Choi); 2w, Is. Namhaedo, 18. VI. 1988. **[JJ]** 1w, Kwaneumsa, 28. VIII. 1998 (D.P. Lyu); 1Q, 3w, Seongpanag, 15. VI. 2001 (D.P. Lyu).

Distribution. Korea, Japan, Taiwan

Remarks. *A. silvestrii* seems to feed mainly on centipedes (Masuko, 1990). Masuko (1993) discovered and reported the peculiar habit whereby queens wound larvae non-lethally and imbibe their haemolymph as food.

Key to the genera of Subfamily Ponerinae in Korea

1. Side of the mandible near its insertion into the head with a small oval or round depression or pit. Outer surfaces of the tibiae of the middle legs usually with a mixture of thickened peg-like setae or narrow spines and normal, thinner hairs ····· ***Cryptopone***
- Side of the mandible near its insertion into the head smooth or with weak ridges. Outer surfaces of the tibiae of the middle legs with all hairs thin and uniform in diameter (although they may differ in length) or lacking hairs altogether ····· 2
2. Tibiae of the hind legs each with two spurs, a large and comb-like (pectinate) behind a much smaller simple one ····· ***Pachycondyla***
- Tibiae of the hind legs each with a single large, comb-like (pectinate) spur ····· 3
3. Lower surface of the petiole (subpetiolar process) with a sharp angle to the rear and a translucent thin spot towards the front when viewed from the side ····· ***Ponera***
- Lower surface of the petiole (subpetiolar process) a simple, rounded lobe when viewed from the side ····· ***Hypoponera***

Subfamily Ponerinae

Genus *Cryptopone* Emery, 1893

Cryptopone Emery, 1893a, *Bulletin Bimensuel de la Société Entomologique de France* 1892 No. 20: 275.

Type species: *Cryptopone testacea* Emery, 1893

Diagnosis

The outer surfaces of the tibiae of the middle legs usually have a mixture of thickened peg-like setae or narrow spines and normal, thinner hairs. The tibiae of the hind legs each have a single large, comb-like (pectinate) spur at their tips (best viewed from the front).

Biology

Nests of *Cryptopone* are usually in soil under rocks, or in rotten wood. The limited information available on these ants suggests that nests are small, with fewer than 100 workers, and that foraging is primarily underground, in leaf litter or in rotten wood. The heavy setae or thin spines on the outer sides of the tibiae of the middle legs are thought to improve traction as workers forage through narrow passages in soil or rotten wood.

2. *Cryptopone sauteri* (Wheeler, 1906) 장님침개미

Pachycondyla (*Pseudoponera*) *sauteri* Wheeler, 1906, *Bulletin of the American Museum of Natural History* 22: 304; Imai & Kubota, 1972: 37: 194; Ogata, 1987: 118.

Euponera (*Pseudoponera*) sauteri: Emery, 1909: 365.

Euponera (*Trachymesopus*) sauteri: Teranishi, 1940: 8.

Cryptopone sauteri: Brown, 1963: 190: 6; Choi, 1985: 411; Choi, 1986: 297; Choi, 1988: 222; Kim *et al*., 1989: 217; Choi & Park, 1991a: 69; Choi & Park, 1991b: 83; Kim *et al*., 1992: 350; Choi & Bang, 1992a: 107; Choi & Bang, 1992b: 16; Choi & Bang, 1992c: 35; Terayama, Choi & Kim, 1992: 23; Choi & Bang, 1993: 321; Choi *et al*., 1993: 347; Choi & Lee, 1995: 193; Choi, 1996a: 209; Choi, 1996b: 12; Choi, 1996c: 46; Kim, 1996: 171; Choi, 1997a: 53; Choi, 1998: 217; Choi & Park, 1998: 59; Choi, 1999: 499;

Worker. Total length of workers around 3.5 - 4 mm. Color yellow to yellowish brown. Body covered thickly with golden hairs. Mandibles with 9 or 10 teeth. Dorsal outline of clypeus gently sloping in lateral view. Subpetiolar process developed, subtriangular and with an angled ventral tip.

Specimens examined. **[GW]** 16w, Kangreung, 25. V. 2002 (D.P.Lyu); 3w, Mt. Seoraksan, 25. VI. 1991 (B.M. Choi); 3w, Mt. Chiaksan, 21. VI. 1998 (B.M. Choi). **[GG]** 32w, Mt. Surisan, 23. VII. 1999 (I.H. Lee); 2Q, 14w. Is. Daecheongdo, 19. VI. 1995 (I.H. Lee); 2w, ibid, 20. VI. 1995 (I.H. Lee); 1Q, 1w, Kwangreung, 11. V. 2001 (D.P.Lyu). **[CB]** 1Q, Mt. Weolak, 21. VI. 2001 (I.H. Lee); 2w, ibid, VII. 1985 (B.M. Choi); 3w, Mt. Kayopsan, 2. VII. 1996 (B.M. Choi); 2w, Mt. Seounsan, 29. V. 1997 (B.M. Choi); 2w, ibid, 30. V. 1997 (B.M. Choi); 5w, Mt. Kunjasan, 6. VII. 1997 (B.M. Choi); 4w, Mt. Cheontaesan, 13. VI. 1996 (B.M. Choi); 1w, Mt. Minjujisan, 13. IX. 1996 (B.M. Choi); 2w, Mt. Songnisan, 1. VI. 1984 (B.M. Choi); 21w, Mt. Heugseongsan, 21. VIII. 2001 (I.H. Lee). **[JB]** 1w, Mt. Deogyusan, 30. VII. 1991 (B.M. Choi); 5w, Mt. Naejangsan, 4. V. 1993 (I.H. Lee); 3w, Is. Bangchukdo, 20. IV. 1993 (B.M. Choi); 2w, ibid, 21. IV. 1993 (B.M. Choi); 2w, Is. Eocheongdo, 4. VIII. 1993 (I.H. Lee); ibid, 3w, 5. VIII. 1993 (I.H. Lee); 5w, Is. Wido, 21. VI. 1994 (I.H. Lee); ibid, 3w, 22. VI. 1994 (B.M. Choi); ibid, 3w, 23. VI. 1994 (B.M. Choi); 1w, ibid, 24. VI. 1994 (B.M. Choi); 1w, Mt. Maisan, 31. V. 1995 (I.H. Lee); 2w, Mt. Unjangsan, 25. V. 1995 (B.M. Choi); 1w, ibid, 26. V. 1995 (I.H. Lee). **[JN]** 4w, 2 m, Jangheung, 26. IV. 2001 (D.P. Lyu); 1w, Is. Daeheuksando, 7. VIII. 1986 (B.M. Choi); 3w, Is. Wando, 25. VI. 1991 (B.M. Choi); 1w, ibid, 11. IX. 1991 (B.M. Choi); 3w, Is. Soheuksando, 24. VI. 1994 (I.H. Lee); 1Q, 5w, ibid, 17. VII. 1994 (I.H. Lee). **[GB]** 2w, Yeongdeok, 3. VIII. 1992 (B.M. Choi); 1w Is. Ulleungdo, 1. VIII. 1989 (B.M. Choi); 2w, ibid, 21. VII. 1995 (B.M. Choi); 2w, ibid, 22. VII. 1995 (I.H. Lee); 3w, ibid, 26. VII. 1995 (B.M. Choi); 4w, Sangju, 10. VII. 1983 (B.M. Choi). **[GN]** 3w, Is. Namhaedo. 19. VI. 1988 (B.M. Choi); 3w, Is. Geojedo, 29. VII. 1988 (B.M. Choi). **[JJ]** 5Q, Gwaneumsa, 16. IV. 1998 (D.P. Lyu); 4w, Seongpanak, 15. VI. 2001 (D.P. Lyu); 14w, 8 m, Hanam, 16-20. VII. 2004 (D.P. Lyu).

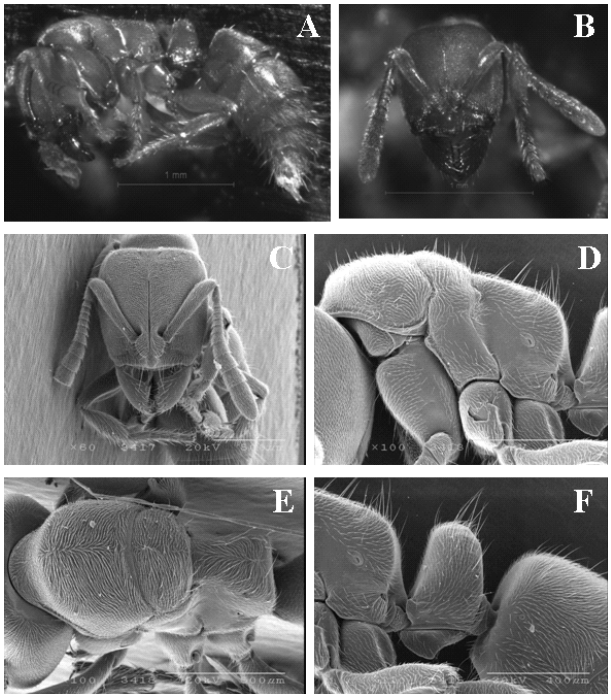

Fig. 2. *Cryptopone sauteri* (Wheeler, W.M.) : A. Lateral view of worker; B. Head, frontal view; C. Portion of antennal insertion; D. Mesosoma, dorsal view; E. Mesosoma, lateral view; F. Petiolar node, lateral view.

Distribution. Korea and Japan.

Remarks. This species nests in rotting wood and leaf litter in forests. Colony size is relatively large compared to other Korean ponerine ants.

Genus *Hypoponera* Santschi, 1938

Hypoponera Santschi, 1938, *Bulletin de la Société*

Entomologique de France 43: 78 (as a subgenus of *Ponera* Latreille). Type species: *Ponera abeillei* André, 1881, *Annales de la Société Entomologique de France* (6) 1: 48, by original designation.

Diagnosis

The node of the petiole has distinct front, top and rear faces. The underside of the petiole (subpetiolar process) is uniformly convex and smooth. The tibiae of the hind legs each have a single large, comb-like (pectinate) spur at their tips (best viewed from the front).

Biology

Hypoponera can be locally abundant and is readily found under rocks and other objects on the ground, in rotten wood and in leaf litter. They are cryptic predators foraging in leaf litter and some species are known to specialise on Collembola. The males of some species are wingless and worker-like (ergatoid).

Key to the species of the Genus *Hypoponera* in Korea

1. Antennal scapes either reaching or surpassing the posterior corner of head ····· ***nippona* (Santschi)**
- Antennal scapes not reaching the posterior corner of head ····· 2
2. Lower halves, at least, of lateral borders of propodeal declivity angulate ····· ***sauteri Onoyama***
- Lateral borders of propodeal declivity rounded ····· ***gleadowi* (Forel)**

3. *Hypoponera gleadowi* (Forel, 1895) 나도황침개미

Ponera gleadowi Forel, in Emery, 1895, *Memorie della R. Accademia delle Scienze dell'Istituto di Bologna* (5) 5: 60.

Ponera gleadowi Forel, 1900, Journal of the Bombay Natural History Society 13: 327.

Ponera gleadowi Emery, 1893b, Annales de la Société Entomologique de France 62: 242.

Hypoponera gleadowi: Taylor, 1967, Pacific Insects Monograph 13: 12.

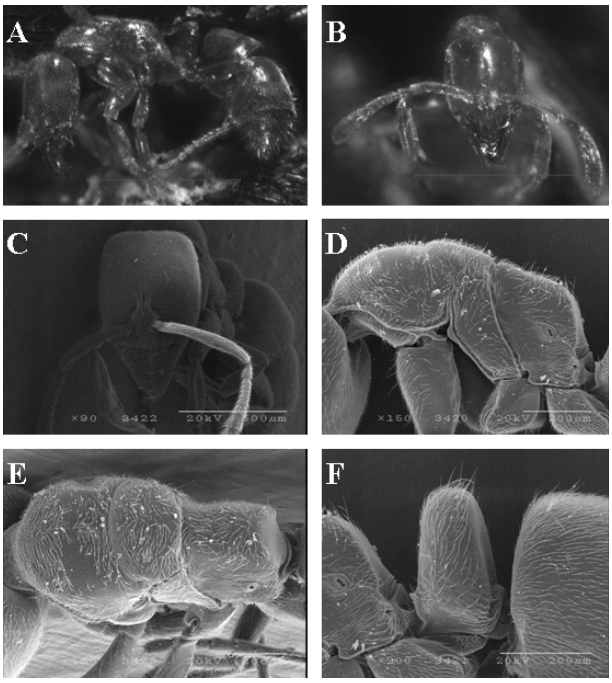

Fig. 3. *Hypoponera gleadowi* Forel : A. Lateral view of worker; B. Head, frontal view; C. Portion of antennal insertion; D. Mesosoma, dorsal view; E. Mesosoma, lateral view; F. Petiolar node, lateral view.

Hypoponera gleadowi: Onoyama, 1989, 41: 5; Choi & Bang, 1992c: 35; Terayama, Choi & Kim, 1992: 24; Choi *et al*., 1993: 347; Choi & Bang, 1993: 321; Choi, 1996c: 46; Kim, 1996: 171; Choi, 1997a: 53.

Worker. Total length of workers around 2.5 mm. Body color yellow to yellowish brown. Scapes not reaching median posterior border of head. Eyes of 1 - 3 facets, situated very near the posterior margin of clypeus (the distance from clypeus to anterior margin of eyes is twice the eye diameter). Petiole thick, 1.5 times as broad as long. Subpetiolar process subtriangular.

Specimens examined. **[GB]** 1w, Uljin, 2. VIII. 1992 (B. M. Choi). **[JJ]** 5w, Seongpanak, 15. VI. 2001 (D.P. Lyu).

Distribution. Korea, Japan, Taiwan, India, Hawaii and North America.

Remarks. Very similar to *H. sauteri*, but distinguished by the thick petiole and the location of the eyes. It nests in the soil.

4. *Hypoponera sauteri* Onoyama, 1989 황침개미

Hypoponera sauteri Onoyama, 1989: 7; Choi, 1986: 297; Choi, 1988: 222; Choi & Park, 1991a: 69; Choi & Park, 1991b: 83; Choi & Bang, 1992c: 35; Terayama, Choi & Kim, 1992: 24; Choi *et al*., 1993: 347; Choi & Bang, 1993: 321; Bolton, 1995: 216; Choi & Lee, 1995: 193; Choi, 1996a: 209; Choi, 1996b: 12; Choi, 1996c: 46; Kim, 1996: 171; Choi, 1997a: 53; Choi, 1997b: 125; Choi, 1998: 217; Choi, 1999: 499; Choi & Park, 1999: 25.

Ponera gleadowi subsp. *decipiens* var. *sauteri* Forel, 1912a, Entomologische Mitteilungen 1: 48.

Worker. Total length of workers around 2 mm. Body color pale yellow to yellowish brown. Eyes each a single unpigmented facet, situated away from the posterior clypeal border (distance from clypeus to anterior margin of eyes 4 - 5 times eye diameter). Subpetiolar process rounded posteroventrally, without lateral carinae. The female is a little larger than the worker.

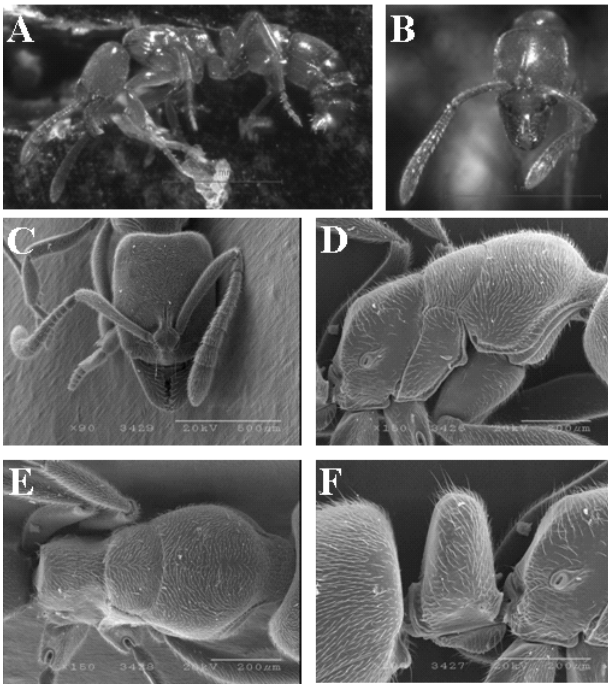

Fig. 4. *Hypoponera sauteri* Onoyama: A. Lateral view of worker; B. Head, frontal view; C. Portion of antennal insertion; D. Mesosoma, dorsal view; E. Mesosoma, lateral view; F. Petiolar node, lateral view.

Specimens examined. **[GG]** 5w, Is. Ganghwado, 10. VIII. 1987 (B.M. Choi); 1Q, 5w, Is. Baengnyeongdo, 13. VI. 1995 (I.H. Lee); 1Q, 3w, ibid, 14. VI. 1995 (B.M. Choi); 3w, ibid, 15. VI. 1995 (B.M. Choi); 2w, ibid, 16. VI. 1995 (I.H. Lee); 1Q, 2w, Is. Daecheongdo, 18. VI. 1995 (I. H. Lee); 2w, ibid, 19. VI. 1995 (B.M. Choi); 1Q, 6w, ibid, 20. VI. 1995 (B.M. Choi). **[CB]** 2w, Mt. Woraksan, VII. 1985 (B.M. Choi); 4w, Mt. Dutasan, 20. IX. 1996 (B.M. Choi); ibid, 1w, 21. IX. 1996 (B.M. Choi); 3w, Mt. Manguksan, 5. IX. 1996 (B.M. Choi); 2w, Mt. Inkyongsan, 23. VIII. 1997 (B.M. Choi); 3w, Mt. Changyongsan, 8. VII. 1996 (B.M. Choi); **[CN]** 2w, Mt. Gyeryongsan, 14. VI. 1990 (B.M. Choi); 2w, ibid, 4. VIII. 1990 (B.M. Choi). **[JB]** 2w, Mt. Naejangsan, 4. V. 1993 (B.M. Choi); 3w, Gunsan, 3. VIII. 1993 (I.H. Lee); 4w, Is. Eocheongdo, 5. VIII. 1993 (I.H. Lee); 1Q, 6w, Is. Wido, 21. VI. 1994 (B.M. Choi); 1Q, 3w, ibid, 22. VI. 1994 (I.H. Lee); 2w, ibid, 23. VI. 1994 (I.H. Lee); 4w, Mt. Maisan, 31. V. 1995 (I.H. Lee); 2w, Gimje, 24. V. 1995 (B.M. Choi); 1w, Iksan, 24. V. 1995 (I.H. Lee); 2Q, 9w, Gochang, 4. V. 1995 (B.M. Choi). **[JN]** 12w, Soheuksando, 25. IV. 1994 (I.H. Lee); 2w, ibid, 17. VII. 1994 (I.H. Lee); 3w, Is. Jaundo, 17. V. 1991 (B.M. Choi); 2w, Is. Jindo, 21. VII. 1989 (B.M. Choi); 1w, ibid, 22. VII. 1989 (B.M. Choi); 4w, ibid, 16. V. 1999 (B.M. Choi); 1w, Is. Gogeumdo, 30. IX. 1989 (B.M. Choi); 2w, Is. Bogildo, 12. IX. 1991 (B.M. Choi); 1w, Is. Soando, 13. IX. 1991 (B.M. Choi); 2w, Is. Daeheuksando, 7. VIII. 1986 (B.M. Choi); ibid, 2w, 4. IX. 1991 (B.M. Choi). **[GB]** 1w, Sangju, 10. VII. 1983 (B.M. Choi); 2w, Is. Ulleungdo, 20. VII. 1995 (I.H. Lee); 3w, ibid, 22. VII. 1995 (I.H. Lee); 2w, Is. Dokdo, 28. VII. 1995 (I.H. Lee). **[JJ]** 2w, Sankumburi, 8. VI. 2001 (D.P. Lyu).

Distribution. Korea, Japan and Taiwan.

Remarks. It nests under stones, in rotting logs and in the soil, especially the humus layer. Common at many places in Korea.

5. *Hypoponera nippona* (Santschi, 1937) 긴수염황침개미

Ponera nippona Santschi, 1937, *Bulletin et Annales de la Société Entomologique de Belgique* 77: 364; Onoyama,

1989: 6; Kim, 1996: 171.

Hypoponera nippona: Ogata, 1987, 25: 123; Terayama, Choi & Bang, 1992: 35; Choi & Kim, 1992: 24; Choi *et al*., 1993: 347; Choi & Bang, 1993: 321; Choi & Lee, 1995: 193; Choi, 1996b: 12; Choi, 1996c: 46; Choi, 1997: 53; Choi, 1998: 217; Choi & Lee, 1998: 2.

Worker. Total length of workers averaging slightly less than 2.5 mm. Body color yellow to yellowish brown. Eyes each a single facet, situated well away from posterior margin of clypeus (the distance from clypeus to anterior margin of eyes is more than 5 times the eye diameter). First gastral tergite twice as broad as petiole. Metanotum prominently and deeply constricted. Petiole broad and elliptical in posterior view.

Specimens examined. **[CB]** 1w, Mt. Weolaksan, 21. VI. 2001 (I.H. Lee); 3w, Mt. Heugseongsan, 30. VII. 2004 (D.P. Lyu); 3w, Mt. Mankunsan, 5. IX. 1996 (B.M. Choi); 2w, Mt. Seounsan, 30. V. 1997 (B.M. Choi); 5w, Mt. Inkyongsan, 29. VIII. 1997 (B.M. Choi); **[JB]** 1w, Is. Bangchukdo, 20. IV. 1993 (B.M. Choi); 1w, Is. Eecheongdo, 5. VIII. 1993 (I.H. Lee); **[JN]** 1Q, 3w, Is. Soheuksando, 22. IV. 1994 (I.H. Lee); 1w, Is. Daeheuksando, 7. VIII. 1986 (I.H. Lee); **[GB]** 1w, Uljin, 2. VIII. 1991 (B.M. Choi); **[JJ]** 2w, Sankumburi, 8. VI. 2001 (D.P. Lyu); 6w, Seongpanak, 15. VI. 2001 (D.P. Lyu); 5w, Hanam, 16-20. VII. 2004 (D.P. Lyu).

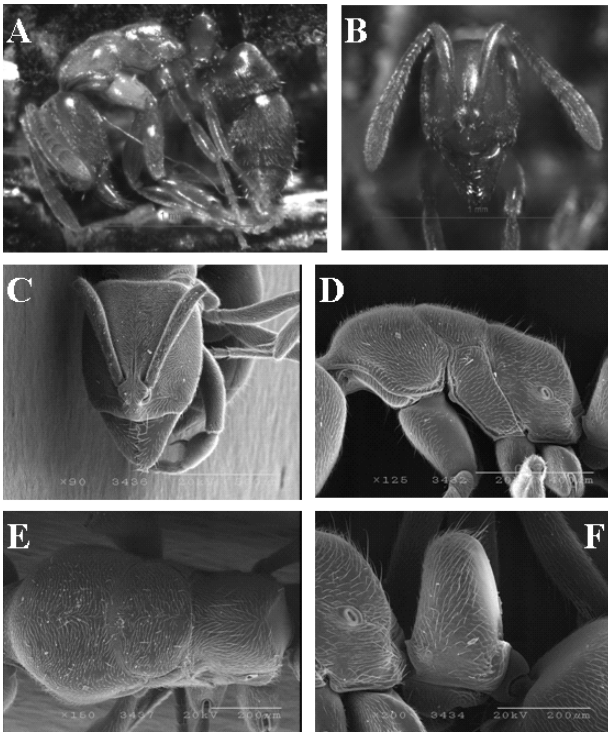

Fig. 5. *Hypoponera nippona* (Santschi) : A. Lateral view of worker; B. Head, frontal view; C. Portion of antennal insertion; D. Mesosoma, dorsal view; E. Mesosoma, lateral view; F. Petiolar node, lateral view.

Distribution. Korea, Japan and Taiwan.

Remarks. It nests in the soil and is rather rare. Reproductive alates are attracted to light and fly during late August.

Genus *Pachycondyla* Smith, 1858

Pachycondyla Smith, 1858, *Catalogue of Hymenoptera Insects in the Collection of the British Museum* 6: 105.

Type species: *Formica crassinoda* Latreille, 1802: 198. by subsequent designation of Emery 1901: 42.

Diagnosis

The node of the petiole has distinct front, top and rear faces. The tips of the tibiae of the hind legs each have two spurs, one large and comb-like (pectinate) and one small and simple (best viewed from the front).

Biology

This is a large and diverse group of ants. They nest in soil either in the open or under rocks and logs, or occasionally in dense vegetation such as grass tussocks. While most are general predators or scavengers, some are specialist predators on termites. Some species will forage on the ground surface while others are limited to leaf litter or under objects on the ground. Some are also known to forage on trees at night. At least one of the species which specialises on termites uses scouts to locate prey and then returns to their nest to recruit additional workers to the newly found food source (Hölldobler and Traniello, 1980).

Key to the species of the Genus *Pachycondyla* in Korea

1. In profile pronotum and mesonotum much higher than propodeum ····· ***chinensis* (Emery)**
- In profile dorsal outline of alitrunk gently curved ····· 2
2. Mesepisternum with an oblique furrow; large species, total body length about 7 mm ····· ***javana* (Mayr)**
- Mesepisternum without oblique furrow; smaller species, total body length < 5 mm ····· ***pilosior* (Wheeler)**

6. *Pachycondyla chinensis* (Emery, 1895) 왕침개미

Ponera nigrita subsp. *chinensis* Emery, 1895c, *Annali del Museo Civico di Storia Naturale di Genova* (2) 14 [34]: 460; Wheeler, W.M. 1921: 530; Ogata, 1987: 116; Wheeler, G.C. & Wheeler, J. 1986: 88; Imai & Kubota, 1972: 194.

Euponera (Brachyponera) nigrita chinensis Emery, 1909: 367.

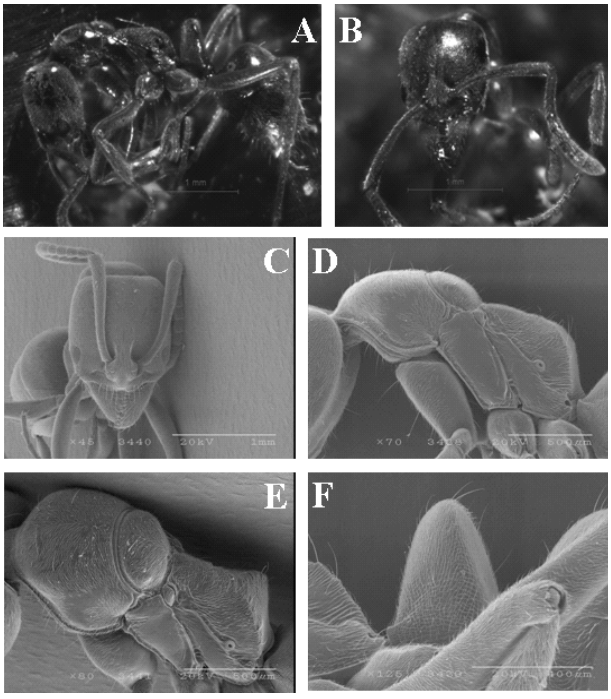

Fig. 6. *Pachycondyla chinensis* (Emery) : A. Lateral view of worker; B. Head, frontal view; C. Portion of antennal insertion; D. Mesosoma, dorsal view; E. Mesosoma, lateral view; F. Petiolar node, lateral view.

Brachyponera chinensis: Brown, 1958a: 22; Choi, 1985: 411; Choi, 1986: 297; Choi & Kim, 1987: 359; Choi, 1988: 222; Kim *et al*., 1989: 217; Choi & Park, 1991a: 69; Choi & Park, 1991b: 83; Choi & Bang, 1992b: 16; Choi & Bang, 1992c: 35; Terayama, Choi & Kim, 1992: 23; Choi & Bang, 1993: 321; Choi *et al*., 1993: 347; Choi & Lee, 1995: 193; Choi, 1996a: 209; Choi, 1996b: 12; Choi, 1996c: 46; Choi, 1997a: 52; Choi, 1997b: 125; Choi, 1998: 217; Choi & Park, 1999: 25.

Pachycondyla chinensis Bolton, 1995 : 304; Kim, 1996: 170; Choi & Lee, 1999: 2.

Worker. Total length of workers around 3.5 mm. Body color black, with light brown mandibles and legs. Antennal scape exceeding posterior margin of head by the length of the second antennal segment. Lateral surface of propodeum more or less sculptured, opaque.

Specimens examined. **[GW]** 6w, Mt. Chiaksan, 21. VII. 1998 (I.H. Lee); 11w, Mt. Seraksan, 25. VI. 1991 (B.M. Choi); 3w, Donghae, 1. VIII. 1992 (B.M. Choi). **[GG]** 9w, Is. Baengnyeongdo, 12. VI. 1995 (I.H. Lee); 11w, ibid, 13. VI. 1995 (I.H. Lee); 3w, ibid, 15. VI. 1995 (B.M. Choi); 1w, Is. Daecheongdo, 19. VII. 1995 (I.H. Lee); 3w, Is. Ganghwado, 10. VIII. 1987 (B.M. Choi); 2w, ibid, 15. V. 1986 (B.M. Choi); 7w, ibid, 12. V. 1986 (B.M. Choi); 2w, ibid, 11. VIII. 1987 (B.M. Choi). **[CB]** 3w, Mt. Sobaeksan, 2. VIII. 1985 (B.M. Choi); 4w, Mt. Dutasan, 20. IX. 1996 (B.M. Choi); 2w, ibid, 21. IX. 1996 (B.M. Choi). **[CN]** 3w, Mt. Gyeryongsan, 6. VI. 1987 (B.M. Choi); 7w, ibid, 14. VI. 1990 (B.M. Choi); 3w, ibid, 4. VIII. 1990 (B.M. Choi). **[JB]** 3w, Byeonsan, 23. IX. 1993 (B.M. Choi); 2w, Gunsan, 3. VIII. 1993 (I.H. Lee); 6w, Is. Eocheongdo, 4. VIII. 1993 (D.P. Lyu); 3w, Buan, 5. V. 1995 (I.H. Lee); 2w, Iksan, 6. V. 1995 (I.H. Lee); 2w, Gochang, 4. V. 1995 (B.M. Choi). **[JN]** 15w, Is. Soheuksando, 22. IV. 1994 (I.H. Lee); 12w, ibid, 20. VII. 1994 (I.H. Lee); 2w, Is. Jaeundo, 17. V. 1991 (B.M. Choi); 3w, ibid, 18. V. 1991 (B.M. Choi); 3w, Is. Jindo, 21. VII. 1989 (B.M. Choi); 2w, ibid, 16. V. 1991 (B.M. Choi); 1w, Is. Gogeumdo, 13. X. 1990 (B.M. Choi); 1w, ibid, 29. IX. 1989 (B.M. Choi); 2w, Is. Bigeumdo, 5. IX. 1991 (B.M. Choi); 2w, Is. Bogildo, 11. IX. 1991 (B.M. Choi); ibid, 3w, 12. IX.

1991 (B.M. Choi); 3w, Is. Soando, 12. IX. 1991 (B.M. Choi); 4w, ibid, 13. IX. 1991 (B.M. Choi); 5w, Is. Daeheuksando, 7. VIII. 1986 (B.M. Choi); 1w, ibid, 4. IX. 1991 (B.M. Choi); 2w, Is. Wando, 25. IV. 1991 (B.M. Choi); 3w, ibid, 11. IX. 1991 (B.M. Choi). **[GB]** 3w, Yeongdeok, 1. VIII. 1991 (B.M. Choi); 1w, Daebo, 3. VIII. 1991 (B.M. Choi); 2w, Is. Ulleungdo, 1. VIII. 1989 (B.M. Choi); 3w, ibid, 20. VII. 1995 (I.H. Lee); 4w, ibid, 24. VII. 1995 (I.H. Lee). **[GN]** 3w, Is. Namhaedo, 1. VI. 1988 (B.M. Choi); 2w, Is. Geojedo, 10. VIII. 1988 (B.M. Choi); 2w, Is. Yokjido, 10. VIII. 1988 (B.M. Choi); 3w, Is. Hansando, 31. V. 1988 (B.M. Choi); 3w, Is. Maemuldo, 30. V. 1988 (B.M. Choi); 1w, Busan, 10. VII. 1988 (B.M. Choi); 2w, Jinhae, 26. VIII. 1988 (B.M. Choi); 2w, Chungmu, 20. V. 1988 (B.M. Choi). **[JJ]** 3w, Gwaneum-sa, 28. VIII. 1998 (D.P. Lyu); 47w, Is. Chujado, 12. VI. 2001 (D.P. Lyu); 17w, Hwasun, 18. X. 2002 (I.H. Lee); 12w, Hanam, 16-20. 2004 (D.P. Lyu).

Distribution. Korea, Mainland China, Taiwan, New Zealand (introduced).

Remarks. The male is characteristically pale in colored and has reduced mandibles. *P. chinensis* is a predator of termites, but there are no relevant field observations.

7. *Pachycondyla javana* (Mayr, 1867) 일본침개미

Ectomomyrmex javanus Mayr, 1867, *Tijdschrift voor Entomologie* 2: 84; Ogata, 1987: 113; Choi & Bang, 1992b: 16; Choi & Bang, 1992c: 35; Terayama, Choi & Kim, 1992: 23; Choi & Bang, 1993: 321; Choi *et al*, 1993: 347; Kim *et al*, 1993: 119; Kim *et al*., 1994: 295; Kim *et al*, 1995: 103; Choi, 1996a: 206; Choi, 1996b: 12; Choi, 1996c: 46; Choi, 1997b: 125; Choi, 1998: 217; Choi and Park, 1998: 59; Choi & Lee, 1999: 2; Choi, 1999: 499.

Ectomomyrmex japonica: Santschi, 1925, *Bulletin de la Société Vaudoise des sciences Naturelles* 56: 82.

Pachycondyla astute Smith: Choi, 1985: 411; Choi *et al*., 1985: 445; Choi, 1986: 297; Choi, 1987: 29; Choi & Kim, 1987: 359; Kim & Choi, 1987: 125; Choi, 1988: 222; Kim *et al*., 1989: 217; Choi & Park, 1991a: 69; Choi & Park, 1991b: 83; Kim *et al*., 1991: 287; Choi & Bang, 1992a: 107.[misidentification]

Pachycondyla javana: Bolton, 1995, 306; Kim, 1996: 170; Choi & Park, 1999: 25.

Worker. The largest known Japanese ponerine ant. Total length of workers around 7 mm. The body generally black in color. Lateral margins of head forming blunt keels. Antennae 12-segmented. Head, mesosoma and petiole.

Specimens examined. **[GW]** 1w, Geojin, 29. VII. 1992 (B.M. Choi); 1w, Temple Naksansa, 30. VII. 1992 (B.M. Choi); 1w, Mt. Seoraksan, 22. VI. 1984 (B.M. Choi); 1w, Chuncheon, 7. VIII. 1991 (B.M. Choi); 2w, Mt. Taebaeksan, 3. VIII. 1988 (B.M. Choi). **[GG]** 2w, Mt. Dobong-san, 7. VII. 1999 (D.P. Lyu); 9w, Mt. Suri-san, 15. X. 1999 (D.P. Lyu); 12w, Kwangreung, 25. V. 2002. (D.P. Lyu); 4w, Is. Ganghwado, 12. V. 1986 (B.M. Choi); 2w, ibid, 11. VIII. 1987 (B.M. Choi); 5w, Is. Baengnyongdo, 13. VI. 1995 (I.H. Lee); 3w, ibid, 17. VI. 1995 (I.H. Lee); 3w, Is. Daecheongdo, 18. VI. 1995 (I.H. Lee); 2w,

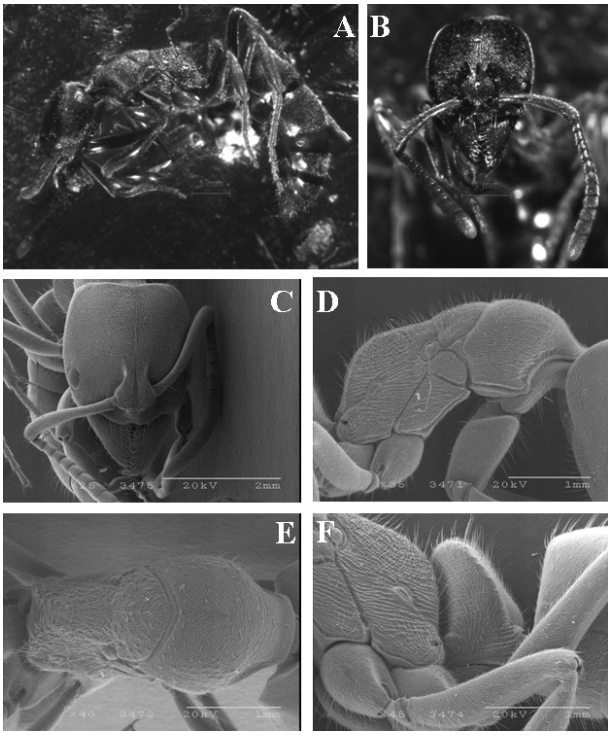

Fig. 7. *Pachycondyla javana* (Mayr) : A. Lateral view of worker; B. Head, frontal view; C. Portion of antennal insertion; D. Mesosoma, dorsal view; E. Mesosoma, lateral view; F. Petiolar node, lateral view.

ibid, 20. VI. 1995 (B.M. Choi). **[CB]** 2w, Sogri-san, ?. X. 1983 (B.M. Choi); 2w, Mt. Wolak-san, 21.VI. 2001. (D.P. Lyu); 3w, Mt. Sobaeksan 2. V. 1985 (B.M. Choi); 3w, Mt. Dutasan, 20. IX. 1996 (B.M. Choi); 3w, Mt. Gunjasan, 6. VII. 1997 (B.M. Choi); 2w, Mt. Inkyongsan, 23. VIII. 1997 (B.M. Choi); 2w, Mt. Baekchoksan, 12. VII. 1997 (B.M. Choi); 3w, Mt. Minjujisan, 13. IX. 1996 (B.M. Choi). **[CN]** 5w, Gongju, 14. V. 2000 (I.H. Lee); 3w, Mt. Gyeryongsan, 25. V. 1986 (B.M. Choi); 2w, ibid, 15. IX. 1990 (B.M. Choi); 2w, ibid, 15. VI. 1987 (B.M. Choi). **[JB]** 2w, Jangsu, 14-18. IX. 1998. (J.Y. Choi) (Yellow Pan Trap); 1w, Mt. Deogyusan, 30. VIII. 1991 (B.M. Choi); 1w, ibid, 29. VII. 1986 (B.M. Choi); 2w, Byeonsan, 23. IX. 1993 (B.M. Choi); 3w, Mt. Naejangsan, 4. V. 1993 (B.M. Choi); 3w, Is. Yeondo, 22. IX. 1993 (I.H. Lee); 3w, Is. Seonyudo, 22. IV. 1993 (B.M. Choi); 2w, Is. Bangchukdo, 20. IV. 1993 (B.M. Choi); 1w, Gunsan, 3. VIII. 1993 (B.M. Choi); 2w, Is. Eocheongdo, 4. VIII. 1993 (B.M. Choi); 3w, Is. Wido, 21. VI. 1994 (I.H. Lee); 4w, Mt. Maisan, 31. V. 1995 (I.H. Lee); 5w, Mt. Unjangsan, 25. V. 1995 (I.H. Lee); 2w, Buan, 5. V. 1995 (B.M. Choi); 2w, Gimjae, 6. V. 1995 (I.H. Lee); 2w, Iksan, 6. V. 1995 (B.M. Choi); 3w, Gochang, 4. V. 1995 (B.M. Choi). **[JN]** 11w, Is. Soheuksando, 22. IV. 1993 (I.H. Lee); 13w, ibid, 17. VII. 1994 (I.H. Lee); 2w, Is. Jaeundo, 17. V. 1991 (B.M. Choi); 3w, Is. Jindo, 22. VII. 1989 (B.M. Choi); 2w, ibid, 16. V. 1991 (B.M. Choi); 1w, Is. Gogeumdo, 30. IX. 1989 (B.M. Choi); 2w, Is. Bigeumdo, 5. IX. 1991 (B.M. Choi); 3w, Is. Bogildo, 12. IX. 1991 (B.M. Choi); 1w, Is. Soando, 5. VIII. 1989 (B.M. Choi); 2w, ibid, 12. IX. 1991 (B.M. Choi); 2w, Is. Daeheuksando, 7. VIII. 1986 (B.M. Choi); 4w, Is. Wando, 11. IX. 1991 (B.M. Choi). **[GB]** 2w, 2larvae, 10pupae, Mt. Mupo-san, 21. VII. 2004. (D.P. Lyu); 5w, Uljin, 2. VIII. 1991 (B.M. Choi); ibid, 5w, 3. VIII. 1992 (B.M. Choi); 3w, Yeongdeok 1. VIII. 1991 (B.M. Choi); 1w, Pohang, 4. VIII. 1991 (B.M. Choi); 10w, Sangju, 10. VII. 1983 (B.M. Choi). **[GN]** 47w, Geochang, 16. V. 2000 (I.H. Lee); 2w, Is. Namhaedo, 19. VI. 1988 (B.M. Choi); 3w, Is. Geojedo, 30. V. 1987 (B.M. Choi); 4w, Is. Maemuldo, 30. V. 1988 (B.M. Choi); 2w, Jinhae, 26. VIII. 1988 (B.M. Choi); 2w, Chungmu, 20. V. 1988 (B.M. Choi). **[JJ]** 34w, Gwaneum-sa, 28. VIII. 1998 (D.P. Lyu); 6w, Sankumburi, 5. VI. 2001(D.P. Lyu); 13w, Seongpanag, 15. VI. 2001 (D.P. Lyu).

Distribution. Korea, Japan, China, Taiwan and part of South East Asia.

Remarks. This species nests under stones at forest margins. Workers may be found foraging individually on the ground; they do not form trails, and are able to sting painfully.

8. *Pachycondyla pilosior* (Wheeler, 1928) 털보장님침개미

Euponera (*Trachymesopus*) *sharpi* subsp. *pilosior* Wheeler, 1928, *Bollettino del Laboratoria di Zoologia generale e agraria del R. Istituto Superiore agrario di Portici* 22: 98; Ogata, 1987: 114.

Euponera (*Trachymesopus*) *chosenensis* Teranishi, 1940, Works of Cho Teranishi. Memorial Volume: 8.

Trachymesopus pilosior: Brown, 1963: 8; Choi & Bang, 1992b: 16; Choi & Bang, 1992c: 35; Terayama, Choi & Kim, 1992: 23; Choi *et al*., 1993: 347; Kim *et al*., 1994: 256; Choi, 1996: 46.

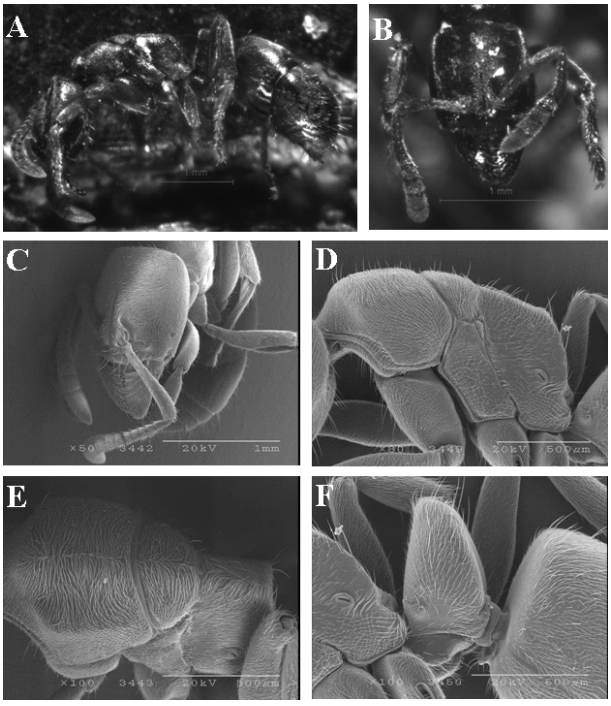

Fig. 8. *Pachycondyla pilosior* (Wheeler) : A. Lateral view of worker; B. Head, frontal view; C. Portion of antennal insertion; D. Mesosoma, dorsal view; E. Mesosoma, lateral view; F. Petiolar node, lateral view.

Pachycondyla pilosior: Bolton, 1995: 308; Kim, 1996: 171.

Worker. Total body length of workers about 4.5 - 5 mm. Color dark reddish brown to blackish brown; antennae, mandibles and legs reddish brown. Head almost square in frontal view, slightly longer than wide. Mandibles each with a basal pit. Eyes small, each with about 10 facets. Subpetiolar process trapezoidal, with sub-angulate antero-ventral and posteroventral corners.

Specimens examined. **[CB]** 1w, Mt. Weolaksan, 20.VI. 2001 (I.H. Lee). **[GN]** 1w, Ulsan, 28. IX. 2002. (D.P. Lyu). **[JJ]** 4w, Gwaneum-sa, 28. VIII. 1998 (D.P. Lyu).

Distribution. Korea and Japan

Remarks. This species is relatively rare. It inhabits forest leaf-litter.

Genus *Ponera* Latreille, 1804

Ponera Latreille, 1804, *Nouveau Dictionnaire d'Histoire Naturelle* 24: 178.

Type species: *Formica coarctata* Latreille, 1802: 65, by subsequent designation of Westwood, 1840: 83.

Diagnosis

The node of the petiole has distinct front, top and rear faces. The underside of the petiole (subpetiolar process) with a translucent thin spot near the front and a sharp angle or pair of small teeth near the rear. The tibiae of the hind legs each have a single large, comb-like (pectinate) spur at their tips (best viewed from the front).

Biology

Species of *Ponera* form small nests with less than 100 workers in protected places on the ground. The most common nesting sites are in the soil with or without coverings, in cracks or between rocks, in rotten wood, or under bark or moss on rotten logs. They forage cryptically in leaf litter on the ground and are often collected using Berlese funnels. Their biology and taxonomy have been discussed by Taylor (1967).

Key to the species of the Genus *Ponera* in Korea

1. Dorsa of mesonotum and propodeum densely punctate, the distances between punctures the length of their radii or less; total length 3 mm or more ····· ***scabra Wheeler***

\- Dorsa of mesonotum and propodeum sparsely punctate, distances between punctures about the length of their diameters; total length 2.5 mm or less ····· ***japonica Wheeler***

9. *Ponera japonica* Wheeler, 1906 침개미

Ponera japonica Wheeler, 1906, *Bulletin of the American Museum of Natural History* 22: 306; Imai & Brown, 1984: 67; Choi, 1985: 411; Choi & Kim, 1987: 359; Choi, 1988: 222; Kim *et al*., 1989: 217; Choi & Park, 1991a: 69; Choi & Park, 1991b: 83; Choi & Bang, 1992a: 107; Choi & Bang, 1992b: 16; Choi & Bang, 1992c: 35; Terayama, Choi & Kim, 1992: 23; Choi *et al*., 1993:

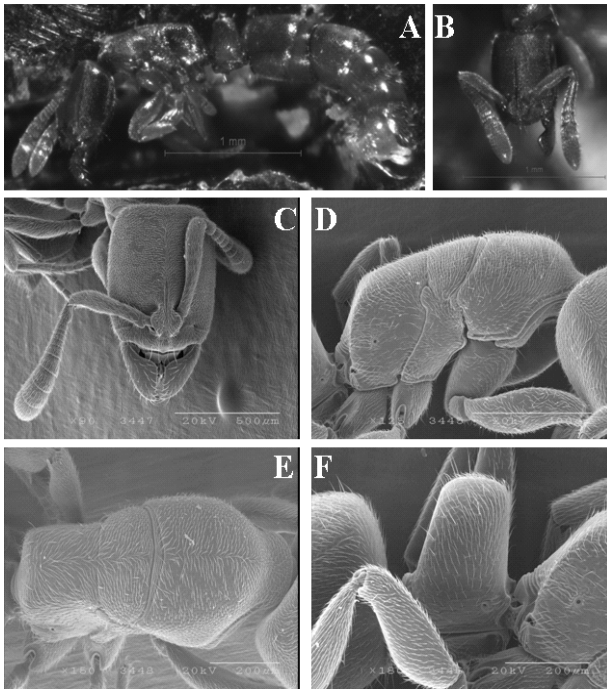

Fig. 9. *Ponera japonica* Wheeler W.M. : A. Lateral view of worker; B. Head, frontal view; C. Portion of antennal insertion; D. Mesosoma, dorsal view; E. Mesosoma, lateral view; F. Petiolar node, lateral view.

347; Choi & Bang, 1993: 321; Kim *et al*., 1994: 256; Choi & Lee, 1995: 193; Choi, 1996a: 209; Choi, 1996b: 12; Choi, 1996c: 46; Kim, 1996: 171; Choi, 1997a: 53; Choi, 1997b: 125; Choi, 1998: 217; Choi & Park, 1998: 59; Choi, 1999: 499; Choi & Lee, 1999: 2; Choi & Park, 1999: 25.

Worker. Total length of workers around 2.5 mm. Body color brown to blackish brown. Scapes not reaching median posterior border of head, failing to do so by at least 1/5 maximum scape thickness.

Specimens examined. **[GW]** 1Q, 4w, Mt. Chiaksan, 21. VII. 1998 (D.P. Lyu); 2w, Temple Naksansa, 30. VII. 1992 (B.M. Choi); 1w, Mt. Seoraksan, 22. VI. 1984 (B.M. Choi); 1w, Donghae, 1. VIII. 1992 (B.M. Choi); 3w, Mt. Taebaeksan, 2. VIII. 1988 (B.M. Choi). **[GG]** 6w, Cheolwon, 22. VII. 2005 (I.H. Lee); 6w, Is. Ganghwado, 11. VIII. 1987 (B.M. Choi); 2w, ibid, 12. VIII. 1986 (B.M. Choi); 6w, Is. Baengnyongdo, 12. VI. 1995 (I.H. Lee); 14w, Is. Daecheongdo, 18. VI. 1995 (I.H. Lee). **[CB]** 1w, Mt. Weolaksan, 19. VI. 2001 (I.H. Lee); 3w, Mt. Sobaeksan 2. V. 1985 (B.M. Choi); 3w, Mt. Dutasan, 20. IX. 1996 (B.M. Choi); 3w, Mt. Gunjasan, 6. VII. 1997 (B.M. Choi); 2w, Mt. Inkyongsan, 23. VIII. 1997 (B.M. Choi); 2w, Mt. Baekchoksan, 12. VII. 1997 (B.M. Choi); 3w, Mt. Minjujisan, 13. IX. 1996 (B.M. Choi); 3w, Mt. Songnisan, 11. VIII. 1984 (B.M. Choi). **[CN]** 5w, Mt. Gyeryongsan, 5. V. 1986 (B.M. Choi); 3w, ibid, 10. V. 1990 (B.M. Choi). **[JB]** 3w, Mt. Deogyusan, 29. VIII. 1991 (B.M. Choi); 5w, Mt. Naejangsan, 4. V. 1993 (I.H. Lee); 2w, Mt. Maisan, 31. V. 1995 (B.M. Choi); 3w, Mt. Unjangsan, 26. V. 1995 (I.H. Lee). **[JN]** 3w, Is. Jaeundo, 17. V. 1991 (B.M. Choi); 11w, Is. Jindo, 21. VII. 1989 (B.M. Choi); 2w, ibid, 16. V. 1991 (B.M. Choi); 1w, Is. Gogeumdo, 25. IV. 1991 (B.M. Choi); 1w, Is. Daeheuksando, 7. VIII. 1986 (B.M. Choi); 8w, Is. Soheuksando, 25. IV. 1994 (B.M. Choi); 2w, ibid, 20. VII. 1994 (I.H. Lee). **[GB]** 6w, Jeongbongsa, 20. VII. 2004 (D.P. Lyu); 1w, Uljin, 2. VIII. 1992 (B.M. Choi); 4w, Is. Ulleungdo, 1. VIII. 1989 (B.M. Choi); 3w, ibid, 21. VII. 1995 (B.M. Choi). **[GN]** 2w, Is. Namhaedo, 18. VI. 1988 (B.M. Choi). **[JJ]** 6w, Gwaneum-sa, 16. IV. 1998 (D.P. Lyu).

Distribution. Korea and Japan.

Remarks. *P. japonica* nests under stones and in the soil, especially in the humus layer. Okamoto (1972) reported that larvae do not spin cocoons and the pupae are thus naked. It is found from low-lying to mountainous sites.

10. *Ponera scabra* Wheeler, 1928 거치른침개미

Ponera scabra Wheeler, 1928, *Bollettino del Laboratoria di Zoologia generale e agraria del R. Istituto Superiore agrario di Portici* 22: 99; Santschi, 1937: 364; Santschi, 1941: 273; Imai & Kubota, 1972: 194; Wilson, 1957: 381; Taylor, 1967: 49; Choi, 1985: 411; Choi, 1986: 297; Choi, 1988: 222; Ogata, 1987: 121; Kim *et al*., 1989: 217; Choi & Park, 1991a: 69; Choi & Park, 1991b: 83; Choi & Bang, 1992a: 107; Choi & Bang, 1992b: 16; Choi & Bang, 1992c: 35; Terayama, Choi & Kim, 1992: 24; Choi *et al*., 1993: 347; Choi & Bang, 1993: 321; Kim *et al*., 1994: 256; Choi & Lee, 1995: 193; Choi, 1996b: 12; Choi, 1996c: 46; Kim, 1996: 171; Choi, 1997a: 53; Choi, 1998: 217; Choi & Park, 1998: 59; Choi, 1999: 499; Choi & Lee, 1999: 2; Choi & Park,

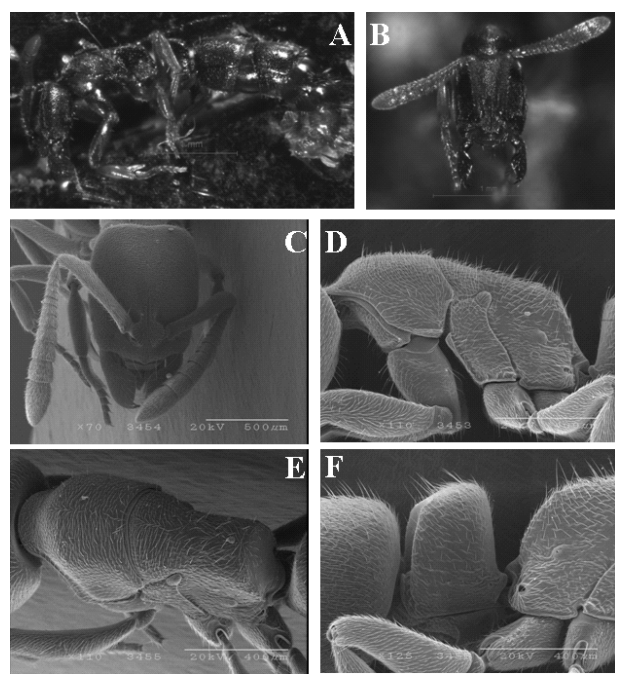

Fig. 10. *Ponera scabra* Wheeler W.M. : A. Lateral view of worker; B. Head, frontal view; C. Portion of antennal insertion; D. Mesosoma, dorsal view; E. Mesosoma, lateral view; F. Petiolar node, lateral view.

1999: 25.

Worker. Total length of workers around 3.5 mm. Body color blackish brown to black. Eyes small, each consisting of several indistinct facets. Petiole more or less trapezoidal in lateral view; its posterior border distinctly concave in dorsal view.

Specimens examined. **[GW]** 8w, Mt. Chiaksan, 21. VII. 1998 (D.P. Lyu); 1w, Mt. Seoraksan, 25. VI. 1991 (B.M. Choi). **[GG]** 1w, Mt. Surisan, 15. X. 1999 (I.H. Lee); 2w, Ganghwado, 14. V. 1986 (B.M. Choi). **[CB]** 9w, Mt. Heugsaongsan, 10. VI. 2004 (I.H. Lee); 5w, Mt. Songnisan, 11. VIII. 1984 (B.M. Choi); 2w, Mt. Mankunsan, 5. IX. 1996 (B.M. Choi); 3w, Mt. Gunjasan, 6. VII. 1997 (B.M. Choi); 3w, Mt. Minjujisan, 13. IX. 1996 (B.M. Choi). **[CN]** 3w, Mt. Gyeryongsan, 25. V. 1986 (B.M. Choi); 3w, ibid, 10. V. 1990 (B.M. Choi); 2w, ibid, 15. IX. 1990 (B.M. Choi). **[JB]** 5w, Mt. Deogyusan, 29. VIII. 1991 (B.M. Choi); 4w, Mt. Naejangsan, 4. V. 1993 (B.M. Choi); 4w, Is. Bangchukdo, 20. IV. 1993 (B.M. Choi); 3w, Is. Wido, 21. VI. 1994 (I.H. Lee); 1w, Mt. Maisan, 31. V. 1995 (B.M. Choi); 3w, Mt. Unjangsan, 25. V. 1995 (I.H. Lee). **[JN]** 2w, Is. Wando, 25. IV. 1991 (B.M. Choi); 3w, Is. Soheuksando, 26. IV. 1994 (I.H. Lee); 4w, ibid, 20. VII. 1994 (I.H. Lee). **[GB]** 8w, Mt. Muposan, 21. VI. 2004 (D.P. Lyu); 1w, Pohang, 5. VIII. 1982 (B.M. Choi); 7w, Sangju, 10. VII. 1983 (B.M. Choi). **[GN]** 2w, Is. Namhaedo, 18. VI. 1988 (B.M. Choi); 2w, Is. Geojedo, 10. VIII. 1987 (B.M. Choi). **[JJ]** 4w, Gwaneumsa, 28. VIII. 1998 (D.P. Lyu); 1Q, Seongpanak, 15. VI. 2001 (D.P. Lyu); 9w, Donaeko, 18. X. 2002 (D.P. Lyu).

Distribution. Korea and Japan.

Remarks. This species nests in the soil. The larvae spin cocoons (Okamoto, 1972).

Subfamily Proceratinae

Genus Proceratium Roger, 1863

Proceratium Roger, 1863, *Berl. Entomol. Z.* 7: 171.

Type species: *Proceratium silaceum* Roger, 1863: 172, by monotypy.

Diagnosis

The upper plate (tergite) of the second segment of the gaster is strongly arched so that it forms the rear-most part of the gaster when viewed from the side, and the remaining segments are pushed forward so that the sting is pointing towards the front. The mandibles have 3 or more teeth.

Biology

These cryptic ants forage in leaf litter. They are thought to be specialized predators of arthropod eggs. Their nests are small, often with less than 100 workers, and are found in soil or rotten wood. They are seldom encountered. For further information see Brown (1958a and 1958b).

Key to the species of the Genus *Proceratium* in Korea

1. The dorsal face of petiole strongly raised medially; petiole the same length than width … ***itoi*** **(Forel)**
- The dorsal face of petiole weakly raised medially;

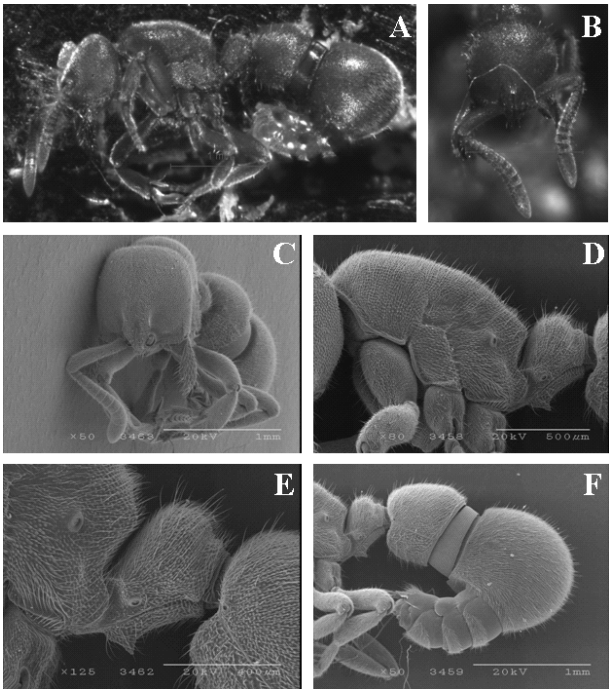

Fig. 11. *Proceratium itoi* (Forel) : A. Lateral view of worker; B. Head, frontal view; C. Portion of antennal insertion; D. Mesosoma, lateral view; E. Propodeum and petiolar node, lateral view; F. Gaster, lateral view.

petiole the longer than width
..... ***watasei*** **(Wheeler)**

11. *Proceratium itoi* (Forel, 1918) 배굽은침개미

Sysphincta itoi Forel, 1918, *Bulletin de la Société Vaudoise des Sciences Naturelles* 51 (1917): 717; Ogata, 1987: 107.

Proceratium itoi: Brown 1958: 247; Choi, 1986: 297; Kim *et al*., 1989: 217; Choi & Park, 1991a: 69; Choi & Park, 1991b: 83; Choi & Bang, 1992c: 35; Terayama, Choi & Kim, 1992: 22; Choi & Bang, 1993: 321; Choi *et al*., 1993: 347; Choi & Lee, 1995: 193; Choi, 1996a: 209; Choi, 1996b: 12; Choi, 1996c: 46; Kim, 1996: 172; Choi, 1997a: 125; Choi, 1997b: 52; Choi, 1998: 217; Choi & Park, 1999: 25.

Worker. Body length of workers around 3 mm. Body color yellowish brown to reddish brown. Anterior clypeal margin projecting in the middle. Frontal carinae wider and overhanging the antennal insertions. Antennal scapes short, reaching about 2/3 the length of head. Posterior margination of propodeum in dorsal view usually not prominent, but in some cases there is much dorsolateral protrusion of the propodeum. Petiole in lateral view subtriangular, its anterior face gently sloping. Subpetiolar process usually small, but sometimes well-developed.

Specimens examined. **[GG]** 1w, Is. Baengnyeongdo, 15. VI. 1995 (B.M. Choi); 1w, Is. Daecheongdo, 20. VI. 1995 (B.M. Choi). **[CB]** 1w, Mt. Heugseongsan, 21. VIII. 2001 (I.H. Lee); 2w, Mt. Seounsan, 29. V. 1997 (B.M. Choi). **[CN]** 1w, Mt. Gyeryongsan, 5. VI. 1987 (B.M. Choi); 1w, ibid, 10. V. 1990 (B.M. Choi). **[JB]** 1w, Mt. Naejangsan, 5. V. 1993 (B.M. Choi); 2w, Is. Yeondo, 22. IX. 1993 (B.M. Choi); 1w, Gunsan, 3. VIII. 1993 (B.M. Choi); 3w, Is. Eocheongdo, 5. VIII. 1993 (B.M. Choi); 6w, Is. Wido, 22. VIII. 1994 (B.M. choi). **[JN]** 4w, Is. Soheuksando, 22. IV. 1994 (B.M. Choi); 2w, ibid, 17. VII. 1994 (I.H. Lee); 1w, Is. Jaeundo, 17. V. 1991 (B.M. Choi); 1w, Is. Jindo, 21. VII. 1989 (B.M. Choi); 1w, Is. Bogildo, 11. IX. 1991 (B.M. Choi); 1w, Is. Wando, 27. IV. 1989 (B.M. Choi). **[GB]** 1w, Is. Ulleungdo, 2. VIII. 1989 (B.M. Choi); 1w, ibid, 22. VII. 1995 (B.M. Choi). **[GN]** 2w, Mt. Cheolmasan, 11. VIII. 2002 (D.P. Lyu); 1w, Samcheonpo, 5. VII. 1988 (B.M. Choi). **[JJ]** 6w, Keopyeong, 8. VI. 2001 (D.P. Lyu); 1w, Seongpanak, 15. VI. 2001 (D.P. Lyu); 3w, Hanam, 16-20. VII. 2004 (D.P. Lyu).

Distribution. Korea, Japan, China and Taiwan.

Remarks. *P. itoi* lives in the soil of glossy-leaved evergreen forests.

12. *Proceratium watasei* (Wheeler, 1906) 와타세침개미

Sysphincta watasei Wheeler W.M., 1906, *Bulletin of the American Museum of Natural History* 22: 303; Ogata 1987: 139

Proceratium watasei; Brown 1958: 248; Terayama, Choi & Kim, 1992: 22; Choi *et al*., 1993: 347; Kim *et al*·., 1994: 256; ; Choi, 1996: 46; Kim, 1996: 172.

Worker. Body length of workers around 3.5 - 4 mm. Body color light yellowish brown to reddish brown. Anterior clypeal margin projecting anteriorly in the middle. Antennal scapes nearly reaching the posterior margin of head. Petiole relatively long and slender, the dorsal face weakly raised medially.

Specimens examined. Unavailable(No specimens).

Distribution. **[HH]** Gaeseong (Collingwood, 1976)

Remarks. *P. watasei* lives in the soil of glossy-leaved evergreen forests.

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