

## Review of the Genus *Apechthis* (Hymenoptera: Ichneumonidae: Pimplinae) from South Korea

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### ABSTRACT

We reviewed South Korean species of the genus *Apechthis* and confirmed four species and two subspecies. In this genus, four species and one subspecies have been reported from the Eastern Palaearctic region, two species and one subspecies were from South Korea. Additionally, we report two species and one subspecies, *Apechthis compunctor orientalis* Kaspryan, 1973, *Apechthis quadridentata* (Thomson, 1877) and *Apechthis rapae* (Uchida, 1925), which were newly recorded for the first time from South Korea. A key to South Korean species of the genus *Apechthis*, redescriptions of newly recorded species and subspecies and digital images of South Korean *Apechthis* are provided.

**Keywords:** endoparasitoid, taxonomy, South Korea

### INTRODUCTION

The genus *Apechthis* is a small ichneumonoid genus that includes 16 species worldwide (Yu et al., 2012). Most species of the genus are endoparasitoids of Lepidoptera (Tortricidae) larva or pupa (Schmidt and Zmudzinski, 2003), but some are parasites of Arachnida, larva or pupa of Coleoptera and Hymenoptera. Oviposition occurs into the larva or pupa of the host (Iwata, 1961). Parasitoids are important in the control of reproduction of injurious insects. There are many examples of insect pest outbreaks that have been suppressed by ichneumonid species, suggesting that ichneumonids can be used to control pests (Bartlett et al., 1978). For example, *Apechthis* is a typical natural enemy of *Euproctis chrysorrhoea*, which is in Lymantriidae (Burgess, 1924). A taxonomic study of the South Korean *Apechthis* was initiated by Kim (1955) who reported one species, *A. capulifera* (Kriechbaumer, 1887) and Uchida (1955) who recorded *A. compunctor compunctor* (Linnaeus, 1758) and *A. rufata* (Gmelin, 1790) from South Korea. In the next 50 years, the South Korean fauna received very little attention. In this study, we report two unrecorded species and one unrecorded subspecies, *Apechthis compunctor orientalis* Kaspryan, 1973, *Apechthis quadridentata* (Thomson, 1877) and *Apechthis rapae* (Uchida, 1925). We also provide rede-

scriptions, photos and a key to the South Korean *Apechthis* species.

### MATERIALS AND METHODS

Materials used in this study were collected by insect net sweeping and Malaise traps, after which they were deposited in the animal systematic laboratory of the Yeungnam University (YNU, Gyeongsan, Korea). Specimens were examined using an AxioCam MRc5 camera attached to a stereo microscope (Zeiss SteREO Discovery, V20; Carl Zeiss, Göttingen, Germany). Digital images were acquired using the AxioVision SE64 software (Carl Zeiss) and optimized with a Delta imaging system (i-solution; IMT i-Solution Inc., Vancouver, Canada).

The abbreviations used in this study are as follows: TD, type depository; TS, type species; HU, Hokkaido University, Faculty of Agriculture, Entomological Institute, Sapporo, Japan; LS, Linnaean Society, Burlington House, Picadilly, London, England, United Kingdom; PM, Phyletisches Museum, Vor dem Neutor 1, D-07743 Jena, Germany; USNM, United States National Museum of Natural History, Smithsonian Institute, Washington, D.C., 20560, U.S.A.; UZM, Universitets Zoologiske Museum, Univer-

sitetsparken 15, Copenhagen, Denmark; ZI, Zoologiska Institutionen, Helgonavägen 3, S-223 62 Lund, Sweden; ZIN, Zoological Institute, Academy of Sciences, St. Petersburg 199034, Russia; ZSM, Zoologisches Staatsammlung, Münchhausenstrasse 21, D-81247 München, Germany; GW, Gangwon-do; GG, Gyeonggi-do; CB, Chungcheongbuk-do; CN, Chungcheongnam-do; GB, Gyeongsangbuk-do; GN, Gyeongsangnam-do; JB, Jeollabuk-do; JN, Jeollanam-do; JJ, Jeju-do.

**SYSTEMATIC ACCOUNTS**

Order Hymenoptera Linnaeus, 1758  
 Family Ichneumonidae Latreille, 1802  
 Subfamily Pimplinae Wesmael, 1845

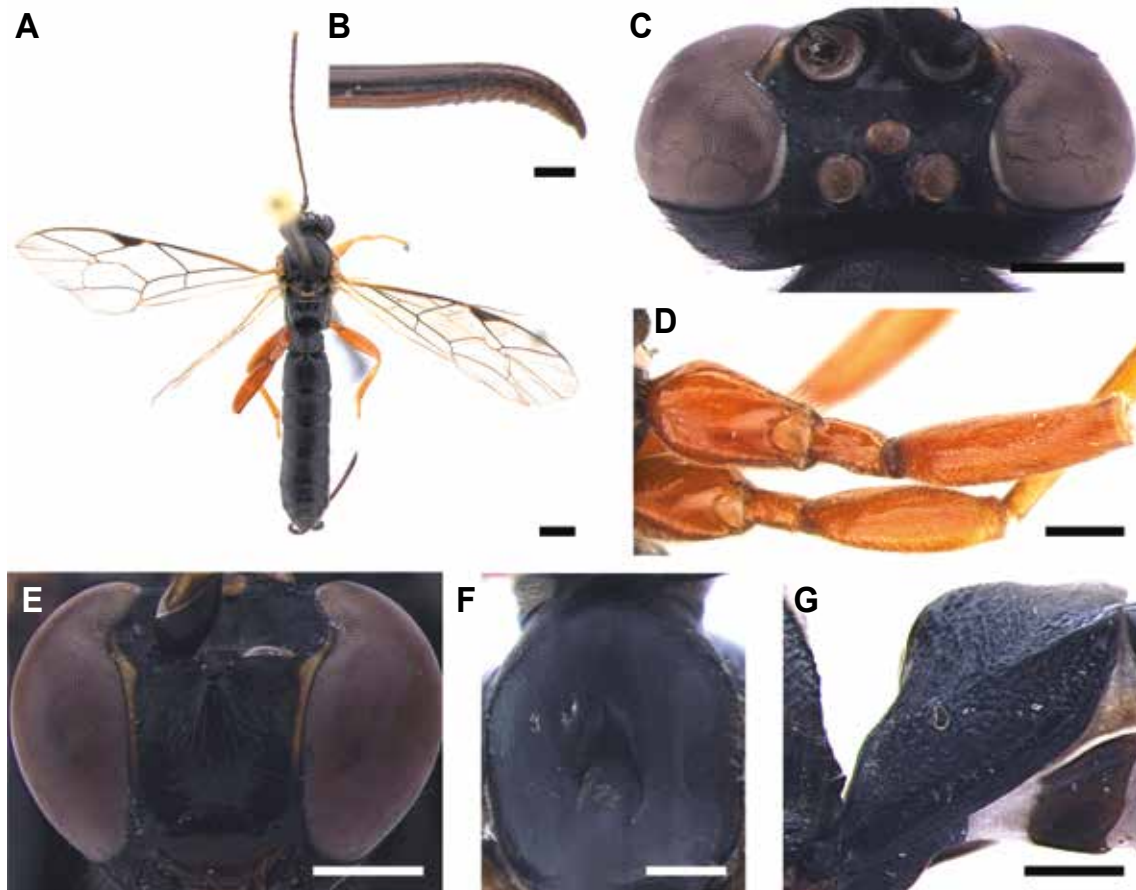
Genus *Apechthis* Förster, 1869  
 (Korean name: Hwang-da-ri-nap-jak-maeb-si-beol-sok)  
*Ephialtes* Schrank, 1802: 261–319. TS: *Ichneumon mani-*

*festator* Linnaeus.  
*Apechthis* Thomson, 1889: 1401–1438. TS: *Pimpla flavonotata* (Viereck).  
*Parapechthis* Blanchard, 1936: 398–407. TS: *Paraperithous aterrimus* (Haupt).  
*Taiwatheronia* Sonan, 1936: 249–257. TS: *Taiwatheronia mahasenae* (Sonan).

**Diagnosis.** Clypeus separated from face by groove, usually with strong transverse basal ridge and flattened apical area. Sternaulus of mesopleuron absent. Fore wing with areolet closed and with 2-RS longer than sections of M between 2-RS and 2m-cu. First tergite large and stout, without glymma, and with spiracle before middle. Ovipositor at least as long as hind tibia, frequently longer, without dorsal subapical notch.

**Key to species of the genus *Apechthis* from South Korea (modified from Kasparyan, 2007)**

1. Hind coxa and apex of hind femur black .....



**Fig. 1.** A-G, *Apechthis compunctor orientalis* Kasparyan, 1973. A, Habitus in dorsal view; B, Ovipositor in lateral view; C, Head in dorsal view; D, Hind coxa and femur in dorsal view; E, Head in frontal view; F, Mesoscutum in dorsal view; G, First tergite in lateral view. Scale bars: A, B=1 mm, C, E-G=0.2 mm, D=0.5 mm.

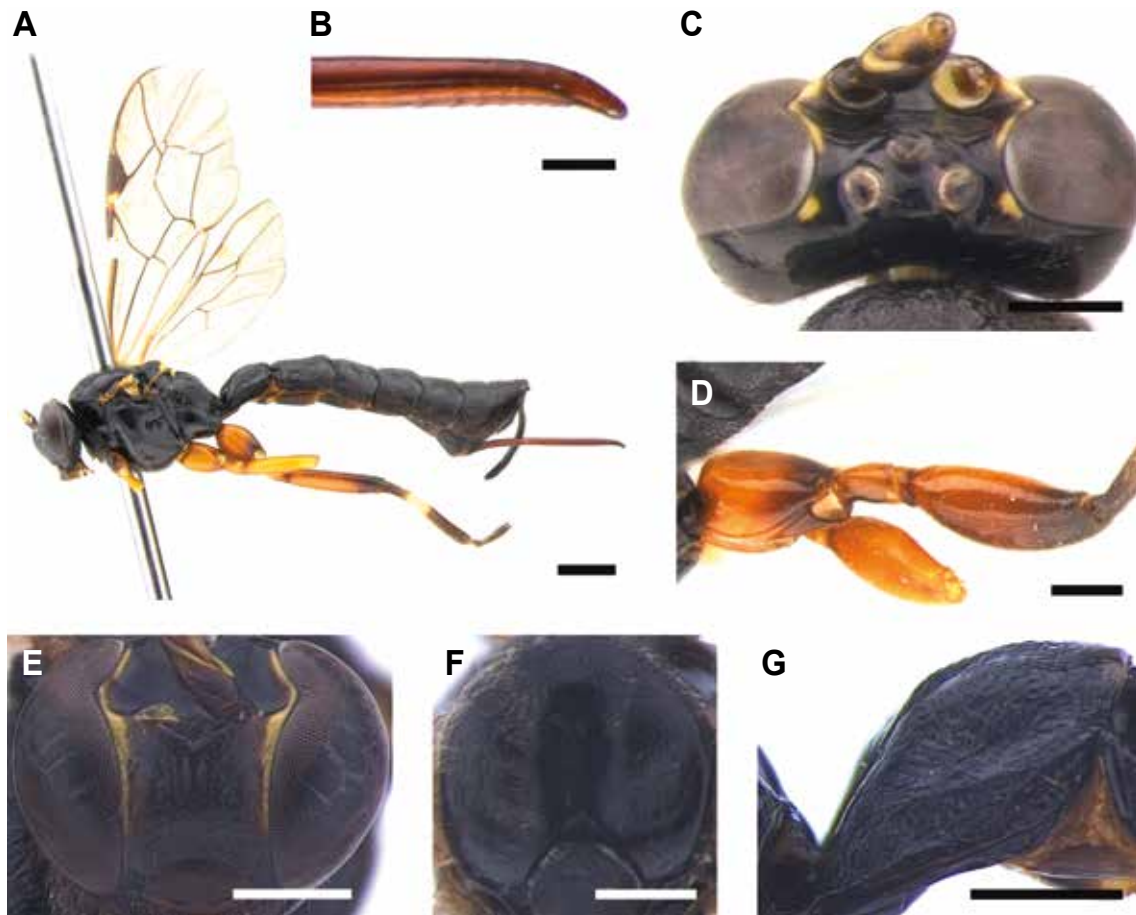
- ..... *A. capulifera* (Kriechbaumer, 1887)
- Hind coxa and hind femur usually completely red (Fig. 3D) ..... 2
- 2. Mesoscutum usually without yellow pattern (Fig. 1F). First tergite with two distinct dorsal protuberances at basal area (Fig. 1G). Tarsal claw of legs of female with a basal tooth. Face yellow with a black spot at middle or almost black (Fig. 1E). Sixth and seventh tergites matt and punctate to apical edge ..... 3
- Mesoscutum with yellow pattern. First tergite with less distinct protuberances at basal area (Fig. 2G). Tarsal claw of hind leg with a basal tooth or without a tooth. Face sometimes yellow (Fig. 3E). Apical area of sixth and seventh tergites sometimes polished ..... 4
- 3. Hind tibia entirely reddish brown .....  
..... *A. compunctor compunctor* (Linnaeus, 1758)
- Hind tibia brown with white band at middle area .....  
..... *A. compunctor orientalis* Kasparyan, 1973
- 4. In females, tarsal claw of hind leg with a basal tooth. In

- males, apical 1/3 area of sixth and seventh tergites matt, punctate and obscure on apical area. Basal-lateral area of mesoscutum with two yellow longitudinal marks in place of notauli ..... *A. rufata* (Gmelin, 1790)
- In females, tarsal claw of hind leg simple, without a basal tooth. In males, apical 1/3 area of sixth and seventh tergites smooth, shiny and rarely and finely punctate, but distinct. Mesoscutum usually almost black (Fig. 2F) .... 5
- 5. In females, tarsal claw of middle leg with a basal tooth .....  
..... *A. quadridentata* (Thomson, 1877)
- In females, tarsal claw of middle leg without a basal tooth .....  
..... *A. rapae* (Uchida, 1925)

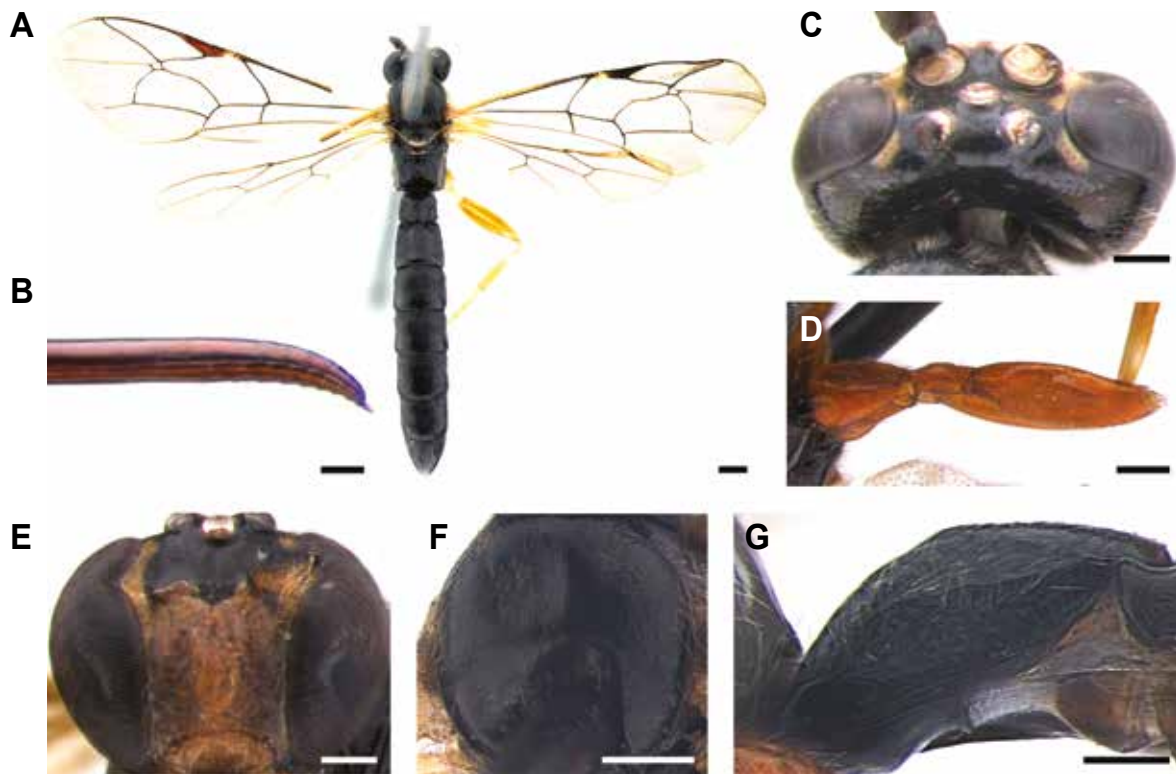
***Apechthis compunctor orientalis* Kasparyan, 1973**

(Korean name: Dong-yang-ju-hong-nap-jak-maeb-si-beol)

*Apechthis compunctor orientalis* Kasparyan, 1973: 679.  
Type: female; TD: ZIN.



**Fig. 2.** A-G, *Apechthis quadridentata* (Thomson, 1877). A, Habitus in lateral view; B, Ovipositor in lateral view; C, Head in dorsal view; D, Hind coxa and femur in lateral view; E, Head in frontal view; F, Mesoscutum in dorsal view; G, First tergite in lateral view. Scale bars: A-C=0.2 mm, D, F=0.5 mm, E, G=2 mm.



**Fig. 3.** A-G, *Apechthis rapae* (Uchida, 1925). A, Habitus in dorsal view; B, Ovipositor in lateral view; C, Head in dorsal view (in male specimen); D, Hind coxa and femur in lateral view; E, Head in frontal view (in male specimen); F, Mesoscutum in dorsal view; G, First tergite in lateral view. Scale bars: A-G=0.2 mm.

**Material examined.** South Korea: 1 female, GG: Yangpyeong-gun, Yongmun-myeon, Yeonsu-ri, Mt. Yongmun-san, Alt. 324 m, 37°31'49.5"N, 127°34'18.8"E, 19 Sep-15 Oct 2009, Lim JG; Mongolia: 1 female, Khan, Khentii, 47°59'20.9"N, 107°22'26.8"E, Alt. 1,846 m, 7 Aug 2009, Lee JW; Russia: 1 female, Sakhalin, Korsakov, Chapa-yevo-2, 46°51'31.1"N, 142°52'59.1"E, 18 Jul 2008, Lee JW; 1 female, Sakhalin, Yuzhno-sakhalinsk, Khristoforovka, 46°53'18.5"N, 142°48'28.6"E, 16 Jul 2008, Lee JW.

**Redescription (female).** Color: black; flagellum reddish brown except brown ventral part. Fore leg reddish brown except black coxa and reddish black apical area of tarsal claw. Mid leg reddish brown except black ventral area of coxa and reddish brown apical area of tarsal claw. Hind leg reddish brown except black basal area of tibia and brown apical area of tibia with yellow band and reddish black fifth tarsomere and apical area of tarsal claw.

Head: Face polished and sparsely punctate with sparse hair, median ridge and yellow longitudinal mark at inner margin of compound eye. Frons smooth and weakly polished with yellow longitudinal mark at apical inner margin of compound eye. Vertex polished and sparsely punctate with sparse hair and yellow spot at each edge of compound

eye. Occipital carina complete, temple flat, sparsely punctate and weakly polished with sparse hair. Clypeus sparsely punctate and entirely polished with sparse hair at basal area, separated from face. Upper tooth of mandible longer than lower tooth, sparsely punctate with sparse hair except at tooth area. Labial palp with four palpomeres and maxillary palp with five palpomeres. Malar space short and sparsely punctate with sparse hair. Inner margin of compound eye unparallel. Antenna flagellum with 24–25 antennomeres.

Mesosoma: Pronotum entirely polished and sparsely punctate with sparse hair at upper area, smooth and rugose at lower apical area. Epomia strong at lower area but weak at upper area. Mesoscutum polished and sparsely punctate with sparse hair, notauli long and weak, mesopleuron polished and sparsely punctate with sparse hair, mesopleural suture distinct and dense. Speculum polished and smooth, mesopleural pit present, epicnemial carina present, postpectal carina and sternaulus absent, scutellum convex, polished and entirely sparsely punctate with sparse hair. Postscutellum wide and broader than high, metapleuron entirely polished and smooth, except sparsely punctate upper area with sparse hair. Propodeum densely punctate with dense hair, propodeal spiracle elongated, areola absent, costula absent,

lateral-median longitudinal carina present to mid area. Leg slender, third tarsomere of hind leg longer than fourth of hind leg. Hind tarsal claw strongly curved. Fore wing with areolet, Rs+M basad to 2-CU1, 1m-cu with one bulla, 2m-cu with two bullae. Hind wing with one basal hamulus and 12 distal hamuli, 1-Rs longer than r-m, cu-a intercepted by 3-CU.

**Metasoma:** Lateral carina of petiole reach to spiracle, distal area of petiole depressed and weakly concave. Thyridium elongated, glymma absent. Ovipositor longer than hind tibia.

**Distribution.** South Korea (new record), China, Mongolia (new record), Russia.

**Region.** Eastern palaeartic.

**Remarks.** This species is reported from South Korea as well as Mongolia for the first time.

***Apechthis quadridentata* (Thomson, 1877)**

(Korean name: Tob-ni-nap-jak-maeb-si-beol)

*Pimpla quadridentata* Thomson, 1877: 732-777. Type: female; TD: ZI.

*Pimpla dendrolimi* Matsumura, 1926a: 27-50. Type: female; TD: HU.

*Pimpla (Apechthis) dendrolimusi* Matsumura, 1926b: 1-42. Type: female; TD: HU.

**Material examined.** South Korea: 1 female, GG: Yangpyeong-gun, Yongmun-myeon, Yeonsu-ri, Mt. Yongmunsan, Alt. 324 m, 37°31'49.5"N, 127°34'18.8"E, 16 Oct-13 Nov 2009, Lim JO; 1 female, GB: Yeongju-si, Punggi-eup, Jungnyeong, 22 Jun-3 Jul 2009, Lim CJ; 1 male, CB: Danyang-gun, Danyang-eup, Cheondong-ri, Mt. Sobaeksan, 24 Apr 1997, Jeong MJ; 1 female, JN: Gurye-gun, Toji-myeon, Naedong-ri, Mt. Jirisan, Piagol, 26 Oct 1996, Lee JW.

**Redescription (female).** Color: black; flagellum reddish black except brown ventral area. Fore leg brown except black dorsal area of coxa and reddish black apical area of tarsal claw. Mid leg reddish brown except reddish black tarsal claw. Hind leg reddish brown except black tibia with white median band and apical area of first-fifth tarsomeres and reddish black tarsal claw.

Head: Face polished and sparsely punctate with sparse hair, yellow stripe on inner margin of compound eye and median ridge, Frons smooth and polished with yellow stripe mark on inner margin of compound eye, stripe mark sometimes weak. Vertex sparsely punctate and polished with two yellow spots on each edge and sparse hair. Occipital carina complete, temple flat, sparsely punctate and weakly polished with sparse hair. Clypeus smooth, entirely polished and separated from face by suture. Upper tooth of mandible longer than lower tooth, punctate with hair except tooth

area. Labial palp with four palpomeres and maxillary palp with five palpomeres. Malar space short and sparsely punctate with sparse hair. Inner margin of compound eye unparallel. Antenna flagellum with 23 antennomeres.

**Mesosoma:** Pronotum entirely polished, sparsely punctate except lower area smooth and lower basal area rugose with sparse hair at upper area and yellow spot on apical upper edge. Epomia strong at lower area, but weak at upper area. Mesoscutum entirely polished and densely punctate with dense hair, notauli long and weak, mesopleuron polished and sparsely punctate with sparse hair, mesopleural suture distinct and dense. Speculum polished and smooth, mesopleural pit present, epicnemial carina present, postpectal carina and sternaular absent. Scutellum convex, entirely polished and sparsely punctate with sparse hair. Postscutellum sparsely punctate and wider than high, metapleurum entirely polished and smooth except upper area sparsely punctate with sparse hair. Propodeum sparsely punctate with sparse hair except median area between median longitudinal carina and densely punctate with dense hair on lateral area, areola absent, costula absent, lateral-median longitudinal carina present to mid area. Propodeal spiracle elongated, leg slender, third tarsomere of hind leg longer than fourth of hind leg. Hind tarsal claw strongly curved. Fore wing with areolet, Rs+M basad to 2-CU1, 1m-cu with one bulla, 2m-cu with two bullae. Hind wing with one basal hamulus and nine distal hamuli. 1-Rs longer than r-m, cu-a intercepted by 3-CU.

**Metasoma:** Lateral carina of petiole reach to spiracle, distal area of petiole depressed and weakly concave. Thyridium elongated, glymma absent. Ovipositor longer than hind tibia.

**Distribution.** South Korea (new record), Albania, Armenia, Austria, Azerbaijan, Belarus, Belgium, Bulgaria, China, Croatia, Czech Republic, Finland, France, Georgia, Germany, Greece, Hungary, Ireland, Italy, Japan, Kazakhstan, Lithuania, Macedonia, Moldova, Mongolia, Netherlands, Norway, Poland, Romania, Russia, Serbia and Montenegro, Slovakia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom, Yugoslavia.

**Region.** Eastern palaeartic, Oriental, Western palaeartic.

***Apechthis rapae* (Uchida, 1925)**

(Korean name: Boorg-eun-ma-di-nap-jak-maeb-si-beol)

*Pimpla rapae* Uchida, 1925: 501-510. Type: female; TD: HU.

**Material examined.** South Korea: GW: 1 female, Pyeongchang-gun, Daegwanryeong-myeon, Byeongnae-ri, Odaesangukripogongwon, Alt. 1,109 m, 37°47'16"N, 128°33'26"E, 27 Jul-30 Aug 2013, Park JY; 2 males, 1 female, Pyeong-

hang-gun, Yongpyeong-myeon, Mt. Gyeongsan, 28 Jun–12 Aug 2012, Park JY; 1 male, 21 Apr–29 May 2004.

**Redescription (female).** Color: black; flagellum reddish brown. Fore leg reddish brown except black coxa and reddish black apical area of tarsal claw. Mid leg reddish brown except reddish black tarsal claw. Hind leg reddish brown except black basal area of tibia and reddish brown apical area of tibia with white median band and reddish brown basal 1/2 area of first tarsomere and black second-fifth tarsomeres and reddish black tarsal claw.

Head: Face polished and sparsely punctate with sparse hair, brown stripe mark on inner margin of compound eye and median ridge. Frons smooth and polished with brown stripe mark on inner margin of compound eye and median longitudinal ridge. Vertex polished and sparsely punctate with sparse hair. Occipital carina complete. Temple flat, weakly polished and sparsely punctate with sparse hair. Clypeus separated from face by suture, entirely weakly polished and smooth except sparsely punctate basal area with sparse hair. Mandible sparsely punctate with sparse hair except tooth area. Labial palp with four palpomeres and maxillary palp with five palpomeres. Malar space short and sparsely punctate with sparse hair. Inner margin of compound eye unparallel. Antenna flagellum with 23 antennomeres.

Mesosoma: Pronotum entirely polished and sparsely punctate with sparse hair at upper area, smooth and rugose at basal lower area. Epomia strong. Mesoscutum entirely polished and densely punctate with dense hair, notauli weak. Mesopleuron weakly polished and sparsely punctate with sparse hair, mesopleural suture distinct and dense. Speculum polished and smooth, mesopleural pit present, epicnemial carina present, postpectal carina and sternaulus absent. Scutellum convex, entirely polished and sparsely punctate with sparse hair. Postscutellum sparsely punctate and wider than high, metapleuron entirely polished and smooth except upper area sparsely punctate with sparse hair. Propodeum sparsely punctate with sparse hair except median area between median longitudinal carina, propodeal spiracle elongated. Areola absent, costula absent, lateral median longitudinal carina present to mid area. Leg slender, third tarsomere of hind leg longer than fourth of hind leg. Hind tarsal claw strongly curved. Fore wing with areolet, Rs+M basad to cuA, 1m-cu with one bulla, 2m-cu with two bullae. Hind wing with one basal hamulus and nine distal hamuli, 1-Rs longer than r-m, cuA intercepted by cu1.

Metasoma: Lateral carina of petiole reach to spiracle, distal part of petiole depressed flat. Thyridium elongated, glymma absent. Ovipositor longer than hind tibia.

**Distribution.** South Korea (new record), Japan, Russia.

**Region.** Eastern palaeartic.

***Apechthis capulifera* (Kriechbaumer, 1887)**

(Korean name: Hwang-da-ri-nap-jak-maeb-si-beol)

*Pimpla capulifera* Kriechbaumer, 1887: 113–121. Type: female; TD: ZSM.

*Pimpla japonica* Dalla Torre, 1901: 1–544. Type: unknown; TD: unknown.

*Apechthis orbitalis* Ashmead, 1906: 169–201. Type: female; TD: USNM.

*Apechthis sapporoensis* Ashmead, 1906: 169–201. Type: female; TD: USNM.

**Material examined.** Data describing specimens used for morphological study are summarized in Tables 1 and 2 to describe seasonal and regional appearance progress of species. (Including 157 males and 133 females specimens)

**Diagnosis.** Body color black. Antenna flagellum with 26–28 antennomeres. Fore leg yellow except black coxa and reddish brown ventral area of femur and apical area of tarsal claw. Mid leg brown except black coxa, reddish brown trochanter, trochantellus and ventral area of femur and apical area of tarsal claw. Hind leg black except reddish brown basal and mid area of femur and white band of tibia. Pronotum entirely polished and sparsely punctate with sparse hair at upper area, smooth at lower area. Epomia strong at lower area, but weak at upper area. Thyridium elongated. Hind tarsal claw strongly curved. Fore wing with areolet, Rs+M basad to cuA, 1m-cu with one bulla.

**Distribution.** Austria, Azerbaijan, Belarus, Bulgaria, China, Czech Republic, Germany, Japan, South Korea, Latvia, Norway, Poland, Romania, Russia, Slovakia, Sweden, Switzerland, Ukraine.

**Region.** Eastern palaeartic, Europe, Oriental, Western palaeartic.

***Apechthis compunctor compunctor* (Linnaeus, 1758)**

(Korean name: Lin-ne-nap-jak-maeb-si-beol)

*Ichneumon compunctor* Linnaeus, 1758: 824. Type: female; TD: LS.

*Ichneumon brassicae* Poda, 1761: 7+122+12. Type: female; TD: unknown.

*Ichneumon cunctator* Scopoli, 1763: 30+420+3. Type: unknown; TD: unknown.

*Ichneumon annulosa* Gmelin, 1790: 2225–3020. Type: female; TD: unknown.

*Ichneumon melanoxantha* Gmelin, 1790: 2225–3020. Type: male; TD: unknown.

*Ichneumon imminutor* Christ, 1791: 535. Type: unknown; TD: unknown.

*Ichneumon vigilans* Christ, 1791: 535. Type: unknown; TD: unknown.

*Ichneumon varicornis* Fabricius, 1793: 519. Type: male; TD:

**Table 1.** Material examined of *Apechthis capulifera* and *A. rufata* (location)

	GG		GW		CB		CN		GB		GN		JB		JN		JJ		Seoul		Incheon		Daejeon		Daegu		Ulsan	
	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
<i>A. capulifera</i>	21	15	32	28	14	21	-	3	22	16	8	2	41	29	-	1	1	1	3	10	1	-	1	6	13	1	-	-
<i>A. rufata</i>	38	97	26	59	14	43	1	5	20	37	2	15	43	44	12	24	2	4	1	14	-	-	4	9	10	4	-	1

GG, Gyeonggi-do; CB, Chungcheongbuk-do; CN, Chungcheongnam-do; GB, Gyeongsangbuk-do; GN, Gyeongsangnam-do; JB, Jeollabuk-do; JN, Jeollanam-do; JJ, Jeju-do.

**Table 2.** Material examined of *Apechthis capulifera* and *A. rufata* (date of collection)

	Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		
	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	
<i>A. capulifera</i>	-	-	20	1	66	42	54	33	12	30	4	10	-	10	-	7	1	-	-
<i>A. rufata</i>	3	6	36	28	52	87	64	117	14	51	3	30	1	12	-	25	-	-	

UZM.

*Ichneumon conjunctor* Panzer, 1804: 260. Type: unknown; TD: unknown.

*Ichneumon varicator* Thunberg, 1822: 249–281. Type: unknown; TD: unknown.

*Pimpla lativentris* Rudow, 1881: 309–312. Type: unknown; TD: lost, Germany.

**Material examined.** 1 female, 1983, R. Hinz.

**Diagnosis.** Body color black. Fore leg reddish brown except reddish black coxa and apical area of tarsal claw. Mid leg reddish brown except black basal area of coxa, reddish black apical area of tarsal claw. Hind coxa reddish brown. Pronotum entirely polished and sparsely punctate with sparse hair at upper area, smooth at lower area; epomia strong. Fore wing with areolet, Rs+M basad to cuA, 1m-cu with one bulla.

**Distribution.** Armenia, Austria, Azerbaijan, Belarus, Belgium, Bulgaria, China, Croatia, Czech Republic, Estonia, Finland, France, Georgia, Germany, Hungary, Ireland, Italy, Japan, Kazakhstan, South Korea, Latvia, Lithuania, Mece-donia, Moldova, Netherlands, Norway, Poland, Romania, Russia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom, Yugoslavia.

**Region.** Eastern palaeartic, Europe, Western palaeartic.

**Remarks.** No Korean specimens were available for this study. However, we have a voucher specimen from Germany. Some parts of the German specimen were broken, including the antenna, hind legs and metasoma.

#### *Apechthis rufata* (Gmelin, 1790)

(Korean name: Geu-mel-rin-nap-jak-maeb-si-beol)

*Ichneumon rufata* Gmelin, 1790: 2225–3020. Type: female; TD: lost.

*Pimpla flavonotata* Holmgren, 1860: 1–76. Type: unknown; TD: unknown.

**Material examined.** Data describing specimens used for morphological study are summarized in Tables 1 and 2 to describe seasonal and regional appearance progress of species (Including 173 males and 356 females specimens).

**Diagnosis.** Body color black with yellow mark at head and mesosoma. Antenna flagellum with 24–26 antennomeres. Fore leg brown except black upper area of coxa and reddish black apical area of tarsal claw. Mid leg reddish brown except reddish black apical area of fifth tarsomere and apical area of tarsal claw. Hind leg reddish brown except black basal area of tibia with white median band, apical area of first-third, fifth tarsomere, fourth tarsomere and tarsal claw. Pronotum entirely polished and smooth with yellow spot at apical upper area. Epomia strong at lower area except weak

at upper area. Thyridium elongated. Hind tarsal claw strongly curved. Fore wing with areolet, Rs+M basad to cuA, Im-cu with one bulla.

**Distribution.** South Korea, Russia.

**Region.** Eastern palaeartic, Western palaeartic, Europe, Oriental.

## ACKNOWLEDGMENTS

This work was supported by a grant from the National Institute of Biological Resources (NIBR). funded by the Ministry of Environment (MOE) of the Republic of Korea (NIBR201501203).

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Received January 31, 2015  
Revised February 17, 2015  
Accepted March 4, 2015