



<http://dx.doi.org/10.11646/zootaxa.3626.4.6>

<http://zoobank.org/urn:lsid:zoobank.org:pub:DD9DF37B-B730-4169-A0BA-67ABE056C013>

## A review of the genus *Anteon* Jurine, 1807 (Hymenoptera: Dryinidae) from South Korea, with description of a new species

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### Abstract

Fifteen species of *Anteon* Jurine 1807 are recognized from South Korea, among which *A. magnatum* Kim & Lee, **sp. nov.** and ten newly recorded species: *A. achterbergi* Olmi, 1991; *A. ephippiger* (Dalman, 1818); *A. esakii* Yasumatsu, 1960; *A. flavicorne* (Dalman, 1818); *A. insertum* Olmi, 1991; *A. medium* Olmi, 1998; *A. pilosum* Xu, Olmi & He, 2010; *A. reticulatum* Kieffer, 1905; *A. septentrionale* Xu, He & Olmi, 2002; *A. takenoi* Olmi, 1995. *A. esakii* Yasumatsu and *A. medium* Olmi are also recorded from Russian Far East and China, Jilin, respectively (new records). Keys to South Korean species of *Anteon* are also provided.

**Key words:** *Anteon magnatum* **sp. nov.**, Anteoninae, Cicadellidae, ectoparasitoids, keys

### Introduction

Genus *Anteon* Jurine, 1807 includes species ectoparasitoids and predators of leafhoppers (Hemiptera: Cicadellidae) (Guglielmino & Olmi 1997, 2006, 2007). It is one of the largest genera of the family Dryinidae, including 422 species present in all world (Xu *et al.* 2013) and about 36 species in Eastern Palaearctic region (Olmi, pers. comm.). The genus *Anteon* has been studied in South Korea mainly by Kim *et al.* (2012). They recognized the presence of only four species as follows: *A. javanum* Olmi, 1984, *A. jurineanum* Latreille, 1809, *A. koreana* Kim & Lee, 2012 and *A. munitum* Olmi, 1984. In recent years, the authors have collected many specimens of Dryinidae from Eastern Asia, not only from South Korea, but also from China and Russian Far East. The results of their research are reported below.

### Material and methods

The morphological terminology used in the present study follows that of Olmi (1984, 1994, 1999). Photographs were taken using an AxioCam MRc5 camera attached to the stereomicroscope (Stemi SV 11 Apo; Carl Zeiss, Göttingen, Germany), processed using AxioVision40AC software (Carl Zeiss), and optimized with an i-delta imaging system (i-Delta 2.6; iMTechnology, Daejeon, Korea).

The following abbreviations are used throughout the text: **AEIC**, American Entomological Institute, Gainesville, Florida, USA; **CNC**, Canadian National Insect Collection, Ottawa, Canada; **ELKU**, Entomological Laboratory, Kyushu University, Fukuoka, Japan; **ELMU**, Entomological Laboratory, Faculty of Agriculture, Meijo University, Nagoya, Japan; **MNHN**, Muséum National d'Histoire Naturelle, Paris, France; **MRSNT**, Museo Regionale di Scienze Naturali, Torino, Italy; **NIBR**, National Institute of Biological Resources, Incheon, South Korea; **NRS**, Naturhistoriska Riksmuseet, Stockholm, Sweden; **MOLC**, Department of Plant Protection, University of Tuscia, Viterbo, Italy (Massimo Olmi's collection); **RNHL**, Rijksmuseum van Natuurlijke Historie, Leiden, The Netherlands; **SCAU**, South China Agricultural University, Guangzhou, Guangdong, P.R. China; **YNU**,

Department of Life Sciences, Yeungnam University, Gyeongsan, South Korea; **ZJUC**, Department of Plant Protection, Zhejiang University, Hangzhou, Zhejiang, P.R. China; **GW**, Gangwon-do; **GG**, Gyeonggi-do; **CB**, Chungcheongbuk-do; **CN**, Chungcheongnam-do; **GB**, Gyeongsangbuk-do; **JB**, Jeollabuk-do; **GN**, Gyeongsangnam-do; **JN**, Jeollanam-do; **JJ**, Jeju-do; **TD**, type depository; **TL**, type locality; **MT**, Malaise trap; **POL**, distance between the inner edges of the two lateral ocelli; **OL**, distance between the inner edges of a lateral ocellus and median ocellus; **OOL**, distance from the outer edge of a lateral ocellus to the compound eye; **OPL**, distance from the posterior edge of a lateral ocellus to the occipital carina.

## Taxonomy

### Subfamily Anteoninae R.C.L. Perkins, 1912

#### Genus *Anteon* Jurine, 1807

*Anteon* Jurine, 1807: 302. Type species: *Anteon jurineanum* Latreille 1809, by monotypy.

*Chelogyne* Haliday, 1838: 518. Type species: *Dryinus infectus* Haliday in Walker 1837, designated by Muesebeck & Walkley 1951. Synonymized by Kieffer, in Kieffer & Marshall 1905.

**Diagnosis.** FEMALE. Fully winged; rarely brachypterous; occipital carina complete; palpal formula 6/3; antenna without rhinaria; fore wing with three cells enclosed by pigmented veins (costal, median and submedian); fore wing with stigmal vein and pterostigma; distal part of stigmal vein much shorter than proximal part, occasionally slightly shorter, as long as, or longer than proximal part; propodeum usually with transverse keel between dorsal and posterior surface; foretarsus chelate; inner side of enlarged claw with proximal prominence bearing one long bristle; tibial spurs 1/1/2. MALE. Fully winged; rarely brachypterous; occipital carina complete; vertex of head usually without two oblique keels connecting posterior ocelli to occipital carina; palpal formula 6/3; fore wing with three cells enclosed by pigmented veins (costal, median and submedian); fore wing with stigmal vein and pterostigma; distal part of stigmal vein much shorter than proximal part, occasionally slightly shorter, as long as, or longer than proximal part; pterostigma less than four times as long as broad; propodeum usually with transverse keel between dorsal and posterior surface; paramere without inner branch wrapping penis; tibial spurs 1/1/2.

### Checklist of South Korean species of *Anteon*

#### 1. *Anteon achterbergi* Olmi, 1991

*Anteon achterbergi* Olmi 1991: 176. TL: Bhujung-Tara Farm (India), TD: RNHL.

**Material examined.** SOUTH KOREA: 1♀, [CB] Cheongwon-gun, Miwon-myeon, Miwon-ri, 05–12.VIII.2005 (MT), J.H. Han (YNU); 2♀, [CN] Daejeon-si, Wa-dong, 36°24.02'N, 127°25.98'E, 16.VII–8.VIII.2006, MT for edge, wild rose patch, P. Tripotin leg. (CNC).

**Hosts.** Cicadellidae Iassinae: *Batracomorphus truncatus* (Li & Wang) (China, Shandong) (Xu *et al.* 2013).

**Distribution.** South Korea (new record), China (Liaoning, Shandong), India, Japan, Philippines, Taiwan, United Arab Emirates (Xu *et al.* 2013).

**Remarks.** The South Korean specimens have slightly larger notauli proportion (notauli : scutum) compared with other country specimens (South Korean specimens=1:3; other country specimens=1:4).

#### 2. *Anteon ephippiger* (Dalman, 1818)

(Fig. 9)

*Gonatopus ephippiger* Dalman 1818: 81. TL: Västergötland (Sweden). TD: NRS.

*Anteon pyonganensis* Móczár 1983a: 184 (synonymized by Olmi, 1984). TL: Pyongyang (North Korea).

*Anteon ephippiger* (Dalman): Móczár 1983b: 198.

**Material examined.** SOUTH KOREA: 1♀, [GB] Gyeongsan-si, Dae-dong, Yeungnam University, 11–24.V.2007 (MT), J.W. Lee (YNU); 1♀, *ditto*, 1–24.III.2012 (MT), J.W. Lee (YNU); 1♂, *ditto*, 12–23.X.2010 (MT), J.W. Lee (YNU); 1♂, [CN] Daejeon-si, Dong-gu, Yongun-dong, Daejeon University, 1–15.VI.2006 (MT), J.W. Lee (YNU); 1♂, [GW] Chuncheon-si, Nam-myeon, Hudong-li, 25.V–14.VI.2003, MT in semi-shade, forest edge, P. Tripotin coll. (CNC); CHINA: 1♀, Jirin-seong, Helong-si, Xicheng-jin, Mingyan-chon (MT), 42°32'48"N, 129°00'38"E, 31.VIII–7.IX.2009, J.W. Lee (YNU).

**Hosts.** Cicadellidae: *Deltocephalus pulicaris* (Fallén) (Italy), *Macropsis* sp. (Poland), *Macrostoteles laevis* (Ribaut) (Poland), *Macrostoteles sexnotatus* (Fallén) (Italy and United Kingdom), *Mocydia crocea* (Herrich-Schäffer) (Italy and United Kingdom), *Opsius lethierryi* Wagner (Italy and Morocco), *Opsius stactogalus* Fieber (Italy), *Opsius* sp. (Spain), *Psammotettix striatus* (Linnaeus) (Japan and Russia) (Fiori 1984; Guglielmino & Olmi 1997; Haupt 1941; Olmi 1994; Olmi 1999; Waloff & Jervis 1987; Waloff & Thompson 1980).

**Distribution.** South Korea (new record), Austria, Belgium, Bulgaria, China (Heilongjiang, Jilin, Liaoning, Ningxia, Xinjiang), Croatia, Czech Republic, Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Japan, Kazakhstan, Kyrgyzstan, Lebanon, Mongolia, Morocco, Netherlands, North Korea, Norway, Poland, Romania, Russia, Slovakia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom (Olmi, 1999; He & Xu, 2002).

**Remarks.** This species, previously reported from North Korea (*Anteon pyonganensis* Móczár, 1983), is now recorded for the first time from South Korea.

### 3. *Anteon esakii* Yasumatsu, 1960

*Anteon esakii* Yasumatsu 1960: 21. TL: Mt. Hiko (Japan), TD: ELKU.

**Material examined.** SOUTH KOREA: 1♀, [CN] Seosan-si, Haemi-myeon, Daegok-ri 880, Hanseo-Univ., 36°41'30"N, 126°34' 50"E, 11.VI–08.VII.2009 (MT), J.W. Lee (YNU); 1♂, [CB] Danyang-gun, Cheondong-ri, Mt. Sobaek, Bukbusa, 7.VII–2.VIII.2005 (MT), J.W. Lee (YNU); 11♂, [CN] Daejeon-si, Dong-gu, Daejeon Univ., 12.IV–12.V.2007 (MT), J.W. Lee (10♂-YNU, 1♂-MOLC); 2♂, [JB] Jeongeup-si, Naejang-dong, Mt. Naejang, Meoknaemigol, 35°29.37'N, 126°53.36'E, 23–31.V.2008 (MT), J.W. Lee (YNU); 1♂, [JB] Wanju-gun, Dongsang-myeon, Daea-ri, Daea Arb., 13–24.VII.2011 (MT), J.W. Lee (YNU); 1♂, [JN] Gurye-gun, Gurye-eup, Nogodan 106, Mt. Jiri National Park, 2.VI–10.X.2011 (MT), J.W. Lee (YNU); 1♂, [JN] Gurye-eup, Toji-myeon, Piagol 124, Mt. Jiri National Park, 35°16'16.6"N, 127°34'17.8"E, 10.III–15.VII (MT), J.W. Lee (YNU); 1♂, [JN] Mt. Naejang National Park, Jangseong-gun, Bukha-myeon, Cheongryangwon, 22.VI–6.VIII.2006 (MT), J.W. Lee (YNU); 1♂, [JN] Jeongeup-si, Ibam-myeong, deungcheon-ri, Wetland, 21.VI.2005, J.W. Lee (YNU); 1♂, [GB] Cheongdo-gun, Unmun-myeon, Mt. Unmun (U4), 25.VI–3.VII.2009 (MT), J.W. Lee (YNU); 1♂, *ditto*, Mt. Unmun (U3), 12–26.IV.2008 (MT), J.W. Lee (YNU); 1♂, *ditto*, Mt. Unmun (U2), 12–26.IV.2008 (MT), J.W. Lee (YNU); 1♂ [GB] Mungyeong-si, Gaeun-eup, Wanjang-ri, Mt. Songni National Park, 6.VI–11.VIII.2011 (MT), J.W. Lee (YNU); 1♂, [GB] Yeongju-si, Punggi-eup, Jungnyeong, 35°53'42.7"N, 128°26' 22.0"E, 22.IV–6.V.2009 (MT), J.W. Lee (YNU); 1♂, [GG] Seoul-si, Cheongyangri-dong, Dongdaemun-gu, 11–18.VII.2005 (MT), W.I. Choi (YNU); 1♂, [GN] Danyang-gun, Danyang-eup, Cheondong (59site), 36°57'25.1"N, 128°25'47.6"E, 12.VI–22.VII.2008 (MT), J.W. Lee (YNU); RUSSIA: 1♂, Primorsky Krai, Vladivostok, 43°15'59"N, 132°02'12.71"E, 29.VI–10.V.2008 (MT), J.W. Lee (YNU); 1♂, *ditto*, 24–31.V.2008 (MT), J.W. Lee (YNU).

**Hosts.** Cicadellidae: *Ledra auditura* Walker (Japan) (Yasumatsu 1960)

**Distribution.** South Korea (new record), Russian Far East (Primorskiy Krai), Japan (Yasumatsu 1960).

**Remarks.** The female holotype is apparently lost (Olmi 1984). However, in ELKU, there is the male allotype (Olmi, pers. comm.).

### 4. *Anteon flavicorne* (Dalman, 1818)

*Gonatopus flavicornis* Dalman 1818: 83. TL: Västergötland (Sweden). TD: NRS.

*Anteon flavicornis* (Dalman): Berland 1928:159.

**Material examined.** SOUTH KOREA: 1♀, [GG] Yangpyeong-gun, Yeonsu, Mt. Yongmun, 324m, N37°31'49.5" E127°34'18.8", 11–25.VI.2009 (MT), J.O. Lim (YNU).

**Hosts.** Cicadellidae: *Acericerus heydenii* (Kirschbaum) (France), *Idiocerus similis* Kirschbaum (Poland), *Idiocerus stigmatalis* Lewis (Italy), *Macropsis graminea* (Fabricius) (France), *Metidiocerus elegans* (Flor) (Italy), *Populicerus albicans* (Kirschbaum) (Italy), *Populicerus confusus* Flor (Germany and Poland), *Populicerus fulgidus* (Fabricius) (France), *Populicerus laminatus* (Flor) (Russia and United Kingdom), *Populicerus populi* (Linnaeus) (United Kingdom), *Populicerus* sp. (United Kingdom), *Psammotettix confinis* (Dahlbom) (Germany), *Rhytidodus decimusquartus* (Schrank) (Italy), *Tremulicerus distinguendus* (Kirschbaum) (Italy), *Tremulicerus vitreus* (Fabricius) (Italy) (Arzone, Alma & Arnò 1988; Chambers 1955; Currado 1983; Giordano, Alma & Arzone 2002; Guglielmino & Olmi 1997, 2006; Haupt 1941; Olmi 1999; Ponomarenko 1978; Waloff & Jervis 1987).

**Parasitoids.** Ismaridae: *Ismarus flavicornis* Thomson (France, Russia, Switzerland and United Kingdom) (Chambers 1955; Kozlov 1970; Nixon 1957; Olmi 1984, 1999, 2000; Tussac & Tussac 1991; Wall 1967).

**Distribution.** South Korea (new record), Algeria, Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Japan, Latvia, Mongolia, Netherlands, Norway, Poland, Russia (European part, Primorskiy Krai), Sweden, Switzerland, Ukraine, United Kingdom (Olmi 1999).

**Remarks.** The South Korean specimens have notauli shorter than other country specimens (South Korean specimens=3:10; other country specimens=5–7:10).

## 5. *Anteon hilare* Olmi, 1984

*Anteon hilare* Olmi 1984: 342. TD: CNC.

*Anteon javanum* Olmi 1984: 437 (synonymized by Xu *et al.* 2013).

*Anteon javanum* Olmi: Kim *et al.* 2012: 101.

**Material examined.** SOUTH KOREA: 1♀, [DJ] Dong-gu, Daejeon University, 12–27.V.2007 (MT), J.W. Lee (3♀-YNU, 1♀-NIBR); 1♀, [GG] Goyang-si, Deogyang-gu, Goyang-dong, 200m, 37°42'33"N, 126°53'39"E, 11–23.VII.2007 (MT), J.O. Lim (NIBR); 1♀, [GG] Namyangju-si, Choan, Songchon, Mt. Ungil, 1–26.V.2009 (MT), J.O. Lim (YNU); 1♀, [CB] Boeun-gun, Mt. Songni, Beopjusamaepyoso, 20.V–3.VI.2007 (MT), J.C. Jeong (YNU); 1♀, [JN], Jeongeup-si, Ssangam-dong, Dapgok-ri, 19.V.2005, J.W. Lee (YNU); 1♀, [GW] Hongcheon-gun, Bukbang-myeon, Seongdong-ri, Jayeonhwangyeongyeongu park, 19–26.VII.2011 (MT), J.W. Lee (YNU); 1♀, [GB] Cheongdo-gun, Unmun-myeon, Mt. Unmun, Munsuseonwon (U2), 15–24.V.2009 (MT), J.W. Lee (YNU); 1♀, [GG] Gapyeong, Cheongpyeong, Goseung, Mt. Homyeong, 168m, 16-30.VII.2009 (MT), J.W. Lee (YNU); 1♀, [CN] Daejeon-si, Wa-dong, 36°24.02'N, 127°25.98'E, 8.VIII–6.X.2006, MT for edge, wild rose patch, P. Tripotin leg. (CNC); 3♂, [CN] Daejeon-si, Wa-dong, N36°24.02', E127°25.98', 31.V–5.VI.2006, MT in shade, small stream, P. Tripotin coll. (CNC).

**Hosts.** Unknown.

**Distribution.** Brunei, China (Guizhou, Zhejiang), India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Philippines, South Korea, Taiwan, Thailand (Xu *et al.* 2013).

**Remarks.** This species is widely distributed in Oriental region, but in Palaearctic region it is known only from China (as *Anteon hilare* Olmi) and South Korea (as *Anteon javanum* Olmi) (Kim *et al.* 2012; Xu *et al.* 2013).

## 6. *Anteon insertum* Olmi, 1991

*Anteon insertum* Olmi 1991: 172. TL: Wu-feng (Taiwan), TD: AEIC.

**Material examined.** SOUTH KOREA: 1♂, [DJ] Dong-gu, Daejeon Univ., 13–28.IV.2006 (MT), J.W. Lee (YNU); 1♂, *ditto*, 1–17.V.2006 (MT), J.W. Lee (YNU); 1♂, [GG] Osan-si, Sucheon-dong 332-4, 31.V–13.VI.2011 (YNU), J.O. Lim (YNU); 2♂, [JB] Namwon-si, Sannae-myeon, Baemsagol, 35°21.57'N, 127°35.03'E, 11.VI–14.VII.2008 (MT), J.C. Jeong (1♂-MOLC, 1♂-YNU).

**Hosts.** Unknown.

**Distribution.** South Korea (new record), China (Liaoning and Ningxia), India, Indonesia, Philippines, Taiwan, Thailand (Xu *et al.* 2013).

**Remarks.** This species is widely distributed in Oriental region, but in Palaearctic region is known only from China (Xu *et al.* 2013) and South Korea (new record).

## 7. *Anteon jurineanum* Latreille, 1809

*Anteon jurineanum* Latreille 1809: 35. TL: Paris (France). TD: MRSNT.

**Material examined.** SOUTH KOREA: 1♀, [GB] Cheongdo-gun, Unmun-myeon, Mt. Unmun, Munsuseonwon (U2), 23.V.2008, J.W. Lee (YNU); 1♀, *ditto*, Ssalbawi (U7), 28.VI.2012, J.W. Lee (NIBR); 1♀, Namsan-ri, Hyeongok-myeon, Gyeongju-si, 15–29.IX.2005 (MT), J.T. Mun (YNU); 1♂, [GW] Donghae-si, Samhwa-dong, Mureung Valley, 15.VII–1.VIII.2005 (MT), J.W. Lee (YNU); 1♂, [CN] Gyeryong-si, Sindoan-myeon, Bunam-ri, Mt. Gyeryong, Donghaksa upper, 14.III–28.VIII.2012 (MT), J.C. Jeong (NIBR).

**Hosts.** Cicadellidae: *Hecalus* sp. (Turkey), *Oncopsis carpini* (J. Sahlberg) (Italy), *Oncopsis flavicollis* (Linnaeus) (Italy, Russia, and United Kingdom), *Oncopsis tristis* (Zetterstedt) (United Kingdom) (Chambers 1955; Giordano, Alma & Arzone 2002; Guglielmino & Olmi 1997, 2006; Ponomarenko 1968).

**Parasitoids.** Ismaridae: *Ismarus halidayi* Förster (United Kingdom) (Olmi 2000).

**Distribution.** Austria, Belgium, Bulgaria, China (Hebei, Liaoning, Shandong, Sichuan), Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Jordan, Kazakhstan, Kyrgyzstan, Latvia, Mongolia, Montenegro, Nepal, Netherlands, Norway, Poland, Portugal, Romania, Russia, Slovenia, South Korea, Spain, Sweden, Switzerland, Turkey, Turkmenistan, United Kingdom (Olmi, 1984, 1994, 1999; He & Xu 2002; Xu *et al.* 2013)

## 8. *Anteon koreanum* Kim & Lee, 2012

*Anteon koreana* Kim & Lee, in Kim *et al.* 2012: 100. TL: Daejeon University (South Korea). TD: YNU.

**Material examined.** SOUTH KOREA: 1♀, [CN] Daejeon -si, Dong-gu, Daejeon-university, 15–30.VI.2006 (MT), J.W. Lee (Holotype, YNU); 1♀, [GG] Mt. Myeongji, Gwimok, Gwimokgogae, 29.VI.1999, D.H.Hwang (Paratype, YNU); 1♀, [GB] Mt. Sodo, 1000m, 13–14.VII.1971, K. Yamagishi leg. (Paratype, ELMU); 1♀, [GG] Mt. Taehwa, Docheog-myeon, Gwangju-si, 219m, 09–24.VI.2007 (MT), J.O. Lim (YNU); 1♀, [GW] Hoengseong-gun, Gapcheon-myeon, Hadae-ri, Holocene, 18–23.VI.2009 (MT), J.W. Lee (YNU); 1♀, [GB] Cheongdo-gun, Unmun-myeon, Mt. Unmun, Munsuseonwon (U1), 6–19.VI.2008 (MT), J.W. Lee (YNU); 1♀, [GG] Mt. Gwanggyo. Suji-gu, Yongin-si, 26.VI–03.VII.2008 (MT), J.O. Lim (YNU); 1♀, [GG] Mt. Kwanag, Manan-gu, Anyang-si, 9–24.VI.2007 (MT), J.O. Lim (YNU); 1♀, [GW] Wongju-si, Heungeom-myeon, Maeji-ri, Yeonse Univ., Wonju campus, 26.VI–19.VII.2009 (MT), H.Y. Han (YNU); 2♀, [GN] Sancheong-gun, Samjang-myeon, Yupyeongni, Wangdeungjae, 35°23.08'N, 127°46.44'E, 16.VI–20.IX.2008 (MT), J.W. Lee (1♀-MOLC, 1♀-YNU); CHINA: 1♀, Jilin, Yanbian, Hunchun, N42°38'17" E130°26'3", 54 m, 21.VII.2010, J.W. Lee (Paratype, YNU).

MALE. Unknown.

**Hosts.** Unknown.

**Distribution.** China (Jilin), South Korea (Kim *et al.* 2012).

**Remarks.** The genus *Anteon* is neuter gender, so original spelling should be changed to *koreanum*.

## 9. *Anteon medium* Olmi, 1998

*Anteon medium* Olmi 1998: 49. TL: Godavari (Nepal). TD: CNC.

**Material examined.** SOUTH KOREA: 1♀, [GG] Mt. Kwanag, Manan-gu, Anyang-si, 9–24.VI.2007 (MT), J.O. Lim (YNU); 1♀, [GG] Incheon-si, Bupyeong-gu, Cheongcheon 1-dong, Incheon butterfly park, 5–19.VII.2011

(MT), J.W. Lee (YNU); CHINA: 1 ♀, Jilin, Helong-si, Xicheong-jin, Mimgyan-chon, 7.IX.2009, J.W. Lee (YNU).  
MALE. Unknown.

**Hosts.** Unknown.

**Distribution.** South Korea (new record), China (new record) (Jilin), Nepal (Olmí 1998).

**Remarks.** The description of the species has been based on only one female specimen from Nepal collected in 1967. Since 1967, this species has not been found again (Xu *et al.* 2013). Now it is newly recorded for the first time in Palearctic region (China and South Korea).

## 10. *Anteon munitum* Olmi, 1984

(Fig. 10)

*Anteon munitum* Olmi 1984: 345. TL: Godavari (Nepal). TD: CNC.

*Anteon bauense* Olmi 1984: 446 (synonymized by Xu *et al.* 2013).

**Material examined.** SOUTH KOREA: 2 ♀, [JN] Yeungam-gun, heomoon-ri, Daedongjae, 31.VII–18.IX.2010 (MT), J.K. Kim (YNU); 3 ♀, [GW] Donghae-si, Samhwa-dong, Mureung Valley, 29.IV–26.V.2007 (MT), J.W. Lee (YNU); 1 ♀, *ditto*, 15–25.VI.2007 (MT), J.W. Lee (NIBR); 1 ♀, Jeongeup-si, Yongsan-dong, 19.V–19.VI.2004 (MT), M.K. Yun (NIBR); 1 ♀, [GN] Busan-si, Yeongdo-gu, Dongsam-dong, Gosin Univ., 27.VI–7.V.2008 (MT), J.W. Lee (YNU); 1 ♂, [GB] Cheongdo-gun, Gakbuk-myeon, Namsan-3ri, 15–29.VI.2008 (MT), J.W. Lee (YNU); 1 ♂, [GG] Mt. Homyeongsan, Goseung, Cheongpyeong, Gapyeong, 220m, 27.V–10.VI.2009 (MT), J.W. Lee (YNU); 1 ♂, [GG] Mt. Kwanag, Manan-gu, Anyang-si, 9–24.VI.2007 (MT), J.O. Lim (YNU); 1 ♂, [GG] Seoul-si, Jongno-gu, Gugi-dong, Gugi valley, Mt. Bukhan National Park, 5.VI–22.VII.2010 (MT), J.C. Jeong (YNU).

**Hosts.** Unknown.

**Distribution.** China (Guangdong, Guizhou, Hainan, Sichuan), Japan, Laos, Malaysia, Myanmar, Nepal, Philippines, South Korea, Sri Lanka, Taiwan, Thailand (Kim *et al.* 2012; Xu *et al.* 2013)

**Remarks.** This species is widely distributed in Oriental region, but in the Palearctic region, it is known only from Japan and South Korea (Kim *et al.* 2012; Xu *et al.* 2013).

## 11. *Anteon pilosum* Xu, Olmi & He, 2010

(Fig. 11)

*Anteon pilosum* Xu *et al.* 2010: 18. TL: Ningxia (China), TD: SCAU.

**Material examined.** SOUTH KOREA: 2 ♂, [CN] Daejeon-si, Dong-gu, Daejeon-university, 27.V.2007, J.W. Lee (YNU); 1 ♂, [GB] Chendo-gun, Unmun-myeon, Mt. Unmun (U1), 35°38'45"N, 128°57'33"E, 6–19.VI.2008 (MT), J.W. Lee (YNU); 7 ♂, [GN] Sancheong-gun, Samjang-myeon, Yupyeongni, Wangdeungjae, 35°23.08'N 127°46.44'E, 16.VI–20.IX.2008 (MT), J.W. Lee (1 ♂-MOLC, 6 ♂-YNU); 1 ♂, [GG] Seoul-si, Jongno-gu, Gugi-dong, Gugi valley, Mt. Bukhan National Park, 5.VI–22.VII.2010 (MT), J.C. Jeong (YNU); 1 ♂, [GG] Namyangju-si, Choan, Songchon, Mt. Ungil, 99m, 37°34'43.2"N, 127°18'40.1"E, 27.V–10.VI.2009 (MT), J.O. Lim (YNU); 1 ♂, [JB] Namwon-si, Sannae-myeon, Baemsagol, 35°21.57'N, 127°35.03'E, 11.VI–14.VII.2008 (MT), J.C. Jeong (YNU); 1 ♂, [JB] Jeongeup-si, Ibam-myeon, Deungcheon-ri wetland, 35°28'44.7"N, 126°48'25.26"E, 21.VI.2005, J.W. Lee (YNU).

FEMALE. Unknown.

**Host.** Unknown.

**Distribution.** South Korea (new record), China (Hainan, Liaoning, Ningxia) (Xu *et al.* 2013).

**Remarks.** This species is known only from China, now it is newly recorded for the first time from South Korea. But, some different characters exist between the two countries: in Chinese specimen the frontal line is incomplete and the notauli are longer (0.7× length of scutum); in South Korean specimens the frontal line is complete and the notauli are shorter (0.3× length of scutum).

## 12. *Anteon reticulatum* Kieffer, 1905

*Anteon reticulatus* Kieffer, in Kieffer & Marshall 1905: 140. TL: Maisons-Laffitte (France), TD: MNHN.

**Material examined.** SOUTH KOREA: 1♀, [CN] Daejeon-si, Dong-gu, Yongun-dong, Daejeon University, 1–15.VI.2006 (MT), J.W. Lee (MOLC); 1♀, [GB] Mungyeong-si, Gaeun-eup, Wanjang-ri, Mt. Songni National Park, 6.VI–11.VIII.2011 (MT), J.W. Lee (YNU); 1♀, [GG] Euijeongbu-si, Howon-dong, Wondobong valley, 8.VI.2010, J.C. Jeong (YNU); 1♀, [GG] Gapyeong-gun, Cheongpyeong-myeon, Mt. Homyeong, 220m, 1–26.V.2009, (MT), J.O. Lim (YNU); 1♀, [GG] Seoul-si, Cheongnyangni-dong, Dongdaemun-gu, 28.VI–4.VII.2005 (MT), W.I. Choi (YNU); 1♀, [JN] Jangseong-gun, Bukha-myeon, Yaksu-ri, Baegyangsa, Mt. Naejang National Park, 12.V–8.VI.2007 (MT), J.W. Lee (YNU); 1♂, [CB] Danyang-gun, Cheondong-ri, Mt. Sobaek National Park, Namcheon valley, 26.IV–25.V.2006 (MT), J.W. Lee (YNU); 1♂, [GW] Donghae-si, Samhwa-dong, Mureung Valley, 37°27'26.28"N, 129°4'57.68"E, 16–28.VI.2005 (MT), J.W. Lee (YNU).

**Hosts.** Unknown.

**Distribution.** South Korea (new record), Austria, China (Jilin, Shaanxi), France, Germany, Hungary, Italy, Japan, Nepal, Netherlands, United Kingdom (Olm 1999; He & Xu 2002)

**Remarks.** A female specimen from GG, Seoul, Dongdaemun-gu, is morphologically distinguished from the holotype and other countries specimens by the following characters: color of antenna brown, except segments 1–2 yellowish; legs totally yellow; notauli very short, hardly visible near anterior margin of scutum.

## 13. *Anteon septentrionale* Xu, He & Olmi, 2002

*Anteon septentrionale* Xu *et al.*, in He & Xu, 2002: 414. TL: Changchun (Jilin, China), TD: ZJUC.

**Material examined.** SOUTH KOREA: 1♀, [CB] Danyang-gun, Cheondong-ri, Mt. Sobaek National Park, Bukbusa, 24.V–20.VI.2006 (MT), J.W. Lee (YNU); 1♀, [JB] Mt. Naejang National Park, Jeongeup-si, Naejang-dong, Wonjeogam, 35°29'36.99"N, 126°53'37.32"E, 13.V.2007, J.W. Lee (YNU); 1♂, [JB] Namwon-si, Sannaemyeon, Baemsagol, 35°21.57'N, 127°35.03'E, 11.VI–14.VII.2008 (MT), J.C. Jeong (YNU).

**Hosts.** Unknown.

**Distribution.** South Korea (new record), China (Jilin) (He & Xu, 2002).

**Remarks.** This species is known only in the Eastern Palaearctic region: South Korea and China (Jilin).

## 14. *Anteon takenoi* Olmi, 1995

*Anteon takenoi* Olmi 1995: 13. TL: Mt. Hiko (Japan), TD: AEIC.

**Material examined.** SOUTH KOREA: 1♀, [GB] Gyeongsan-si, Dae-dong, Yeungnam Univ., 30.IV–7.V.2007 (MT), J.W. Lee (YNU); 1♀, [GB] Yeongcheon-si, Hwabuk-myeon, Mt. Bohyeon, 11.V.1998, J.W. Lee (YNU); 1♀, [CN] Seosan-si, Haemi-myeon, Daegok-ri 880, Hanseo Univ., 14.V–11.VI.2009 (MT), J.W. Lee (YNU); 1♀, [JN] Suncheon-si, Songgwang-myeon, Mt. Jogyesan, Seonamsa, 4.V.1990, S.M. Ryu (YNU); 1♂, [CB] Danyang-gun, Cheondong-ri, Mt. Sobaek National Park, Namcheon valley, 26.IV–25.V.2006 (MT), J.W. Lee (YNU); 1♂, [CN] Seosan-si, Haemi-myeon, Daegok-ri 880, Hanseo Univ., 22.IV–6.V.2009 (MT), J.W. Lee (YNU); 1♂, *ditto*, 6–14.V.2009 (MT), J.W. Lee (YNU); 1♂, [GB] Gyeongsan-si, Dae-dong, Yeungnam University, 8–23.VI.2006 (MT), J.W. Lee (YNU); 1♂, *ditto*, 17–24.IV.2009 (MT), J.W. Lee (YNU); 1♂, [GW] Chuncheon-si, Sanong-dong 218-5, Gangwondoriphwamogwon, 8–20.VI.2011 (MT), J.W. Lee (YNU); 1♂, [GW] Wonju-si, Baegunsan, 37°15.30'N 127°58.55'E, 6–19.VI.2011 (MT), H.Y. Han leg. (MOLC); 1♂, [GW] Donghae-si, Samhwa-dong, Mureung Valley, 37°27'52"N, 129°01'26"E, 29.IV–26.V.2007 (MT), J.W. Lee (YNU); RUSSIA: 1♀, Primorskiy Krai, Khasansky District, Barabash, 22.VI.2008, J.W. Lee (YNU).

**Host.** Unknown.

**Distribution.** South Korea (new record), China (Liaoning, Shaanxi, Sichuan), Japan, Russia (Primorskiy-Krai) (Xu *et al.* 2001, 2013).

**Remarks.** This species was firstly reported from Russia based on male specimens only. Now we added a female specimen from Russia also.

**15. *Anteon magnatum* Kim & Lee, sp. nov.**

(Figs 2–8)

**Type material.** *Holotype*, 1♀, SOUTH KOREA: [GB] Yeongyang-gun, Subi-myeon, Mt. Baegam, 7.V.1999, J.W. Lee (YNU). *Paratypes*, SOUTH KOREA: 1♀, [GW] Wonju-si, Socho-myeon, Hakgok-ri, Mt. Chiak National Park, 29.V–19.VI.2010 (MT), J.W. Lee (YNU); 2♀, [CN] Seosan-si, Haemi-myeon, Hanseo Univ., 22.IV–6.V.2009 (MT), J.W. Lee (YNU); 1♀, [GB] Gyeongju-si, Hyeongok-myeon, Namsan-ri, 18–25.VIII.2005 (MT), J.T. Mun (YNU); 1♀, [CB] Chungju-si, Jongmin-dong, Mt. Gyemyeongsan, 14.VIII.1997, J.W. Lee (YNU); 1♀, [JB] Jeongeup-si, Yongsan-dong, 19.V.2004, K.B. Kim (YNU); 1♀, [CN] Daejeon-si, Wa-dong, 36°24.02'N, 127°25.98'E, 8.VIII–6.X.2006, MT for edge, wild rose patch, P. Tripotin leg. (CNC).

**Description.** *Holotype* (FEMALE). *Head.* Broader than mesosoma, shiny, smooth, completely reticulate rugose and covered with hairs; clypeus with oral margin rounded and covered with long hairs; face with two lateral longitudinal keels near orbits directed towards antennal toruli; frontal line complete; occipital carina complete; POL: 10; OL: 6; OOL: 10; OPL: 10; TL: 7; antenna clavate; antennal segments in following proportions: 26.0: 11.5: 15.5: 10.5: 10.0: 10.0: 11.0: 10.5: 11.0: 13.0.

*Mesosoma.* Pronotum with anterior half strongly sculptured by transverse keels and rugose; posterior half shiny, smooth, transverse and with longitudinal keels and median longitudinal groove; pronotal tubercle reaching tegula. Scutum and scutellum shiny, smooth and punctate; notauli incomplete, reaching approximately 0.5× length of scutum. Metanotum shiny, smooth, unsculptured, except strong median keel. Scutellum and metanotum 0.45× and 0.3× as long as scutum. Propodeum with strong transverse keel between dorsal and posterior surface; dorsal surface 0.8× as long as posterior surface in lateral view, dull, reticulate rugose, and covered with short hairs; posterior surface with two complete longitudinal keels; upper part of posterior surface median area as rugose as lateral area and lower part transversally striate. *Wing.* Wings fully developed. Fore wing hyaline, weakly yellowish, without dark transverse bands, covered with brown setae; distal part of stigmal vein much shorter than proximal part, 4.0× as long as proximal part. *Legs.* Enlarged claw with proximal prominence bearing one long bristle. Foretarsal segments in following proportions: 14: 2: 2: 3: 8. Arolium very large, about as long as enlarged claw. Fifth segment of foretarsus (Fig. 6) with one row of 3 lamellae + 11 bristles, laterally expanded and forming wide and slightly concave lamina (concavity with one row of 16 bristles); distal apex with two rows of 10 lamellae.

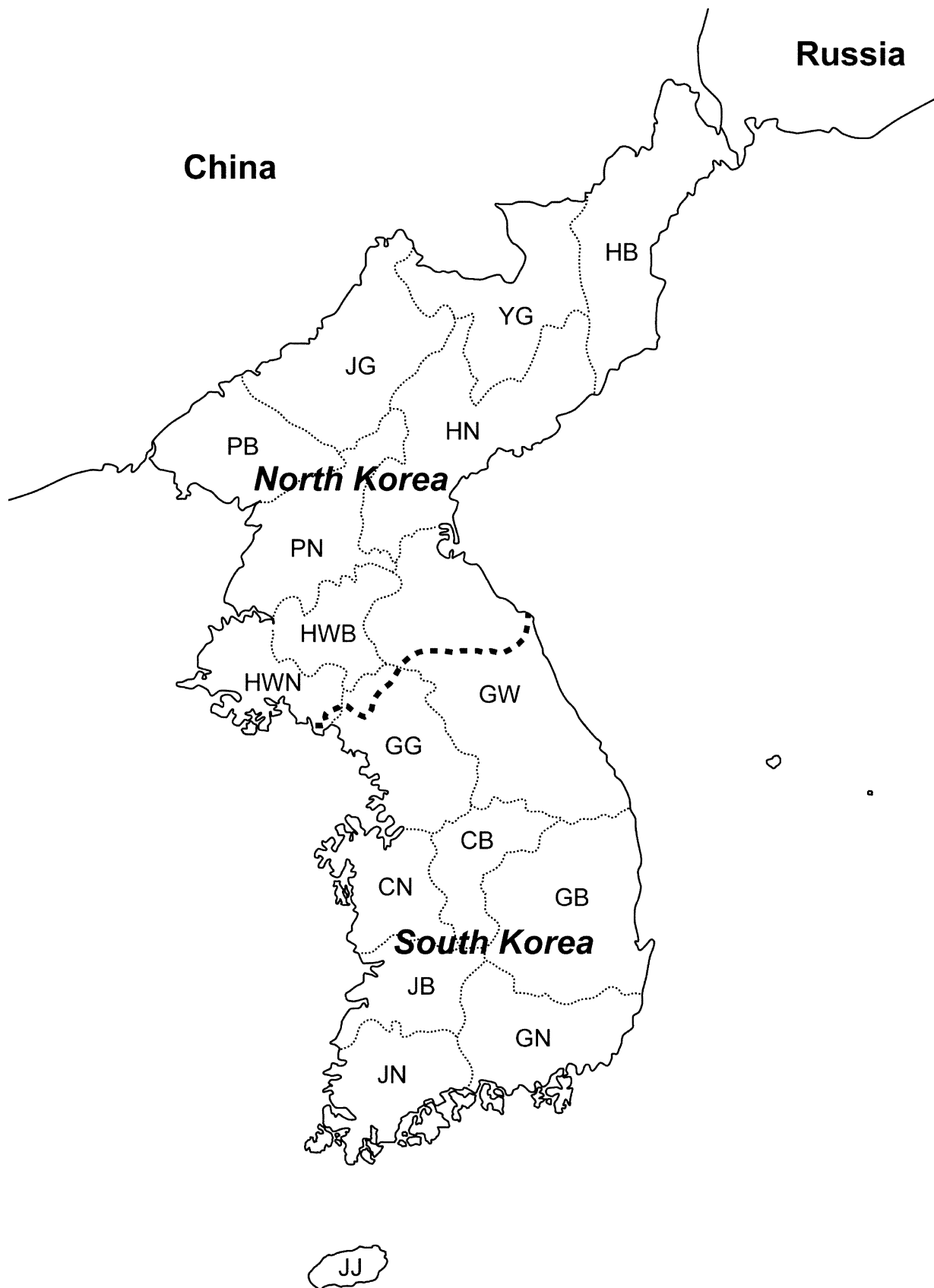
*Metasoma.* Shiny and smooth; segments 10 with numerous short setae.

*Color.* Head black, except distal third of mandible yellowish-brown; antenna reddish-brown, except segments 6–10 dark-brown; legs brown, with basal part of fore- and midcoxae, almost completely testaceous hindcoxae and hindfemora almost completely black; fore- and midfemora dark-brown; metasoma dark-brown.

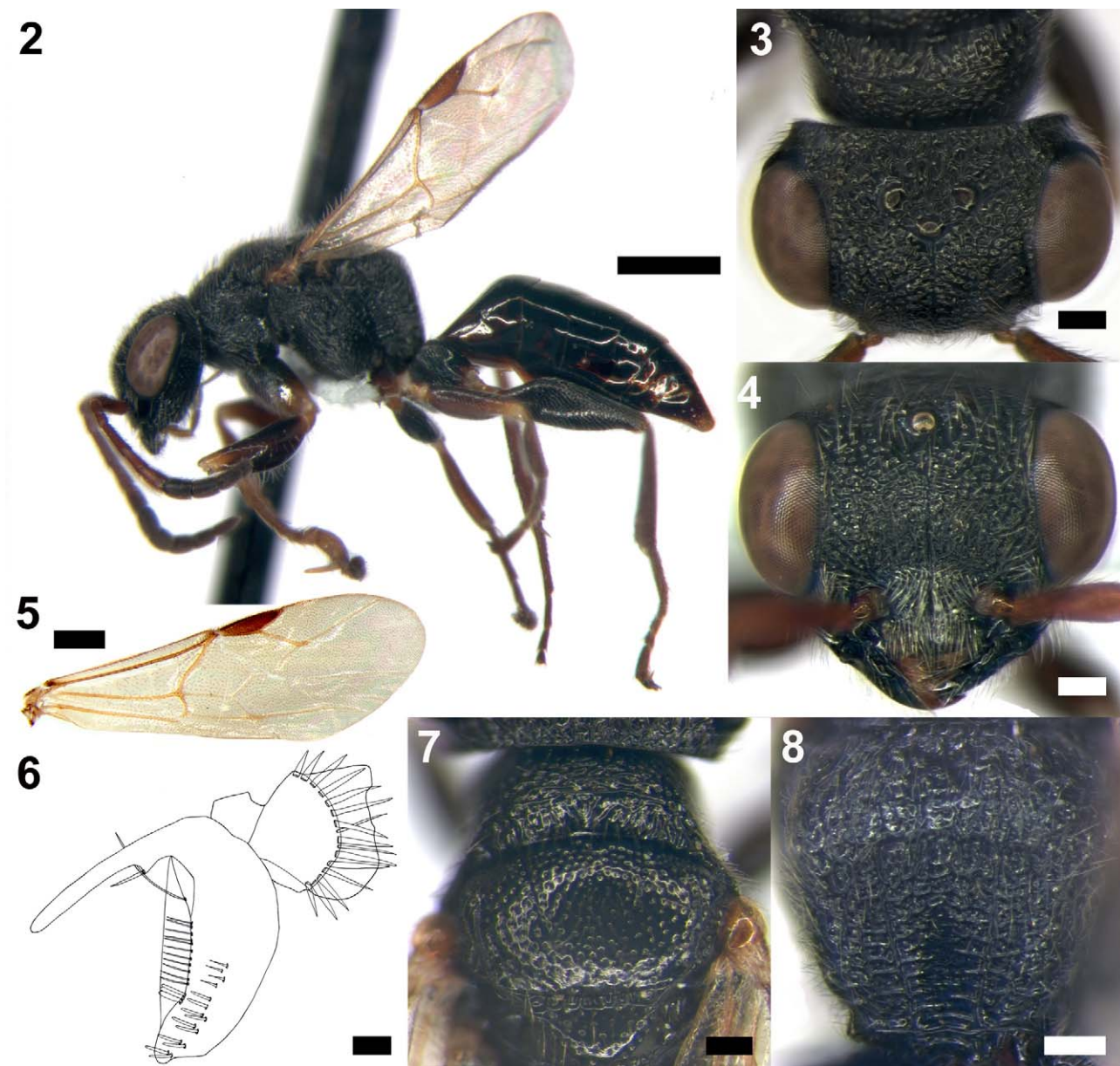
*Measurements.* Head length 1.09 mm, width 1.63 mm; mesosoma length 2.40 mm, maximum width 1.39 mm; metasoma length 2.89 mm; fore wing length 4.29 mm; total body length 6.38 mm.

*Variations.* Color of mandible very variable, almost completely black or distal one-third and distal two-thirds almost completely yellowish-brown; antennal segments 5–10 or 6–10 dark-brown; legs of some specimens almost completely yellowish-brown (partly whitish); pronotum longitudinal groove weakly or distinctly present; notauli 0.5× length of scutum or short and hardly visible near anterior margin of scutum; fifth segment of foretarsus with one row of 2–4 lamellae + 6–12 bristles, laterally expanded and forming wide and slightly concave lamina (concavity with one row of 16–18 bristles); distal apex with one or two rows of 6–10 lamellae; Head length 0.77–1.09 mm (mean=0.97 mm), width 1.23–1.63 mm (1.43 mm); mesosoma length 1.64–2.40 mm (2.19 mm), maximum width 1.03–1.48 mm (1.28 mm); metasoma length 1.84–2.89 mm (2.41 mm); fore wing length 2.83–4.33 mm (3.72 mm); total body length 4.25–6.38 mm (5.57 mm).





**FIGURE 1.** Map of the Korean peninsula with the abbreviations of each province: **CB**, Chungcheongbuk-do; **CN**, Chungcheongnam-do; **GB**, Gyeongsangbuk-do; **GG**, Gyeonggi-do; **GN**, Gyeongsangnam-do; **GW**, Gangwon-do; **HB**, Hamgyeongbuk-do; **HN**, Hamgyeongnam-do; **HWB**, Hwanghaebuk-do; **HWN**, Hwanghaenam-do; **JB**, Jeollabuk-do; **JG**, Jagang-do; **JJ**, Jeju-do; **JN**, Jeollanam-do; **PB**, Pyeonganbuk-do; **PN**, Pyeongannam-do; **YG**, Yanggang-do.



**FIGURES 2–8.** *Anteon magnatum* sp. nov., ♀. 2. Lateral habitus; 3. Head in dorsal view. 4. Head in anterior view; 5. Fore wing; 6. Chela; 7. Scutum; 8. Propodeum. Scale bars: 1.0 mm for 2; 0.5 mm for 5; 0.2 mm for 3, 4, 7, 8; 0.1 mm for 6.

**MALE.** Unknown.

**Host.** Unknown.

**Distribution.** South Korea.

**Remarks.** By segment 5 of foretarsus laterally expanding and forming wide and slightly concave lamina, *Anteon magnatum* sp. nov. is similar to *A. laminatum* Olmi, 1987, known from the Oriental region. The main difference between these two species regards the posterior surface of propodeum, with two longitudinal keels in *A. magnatum* and without longitudinal keels in *A. laminatum*.

**Etymology.** The specific name is derived from the Latin words *magnum* and *latum*, which mean “large” and “wide”, respectively.

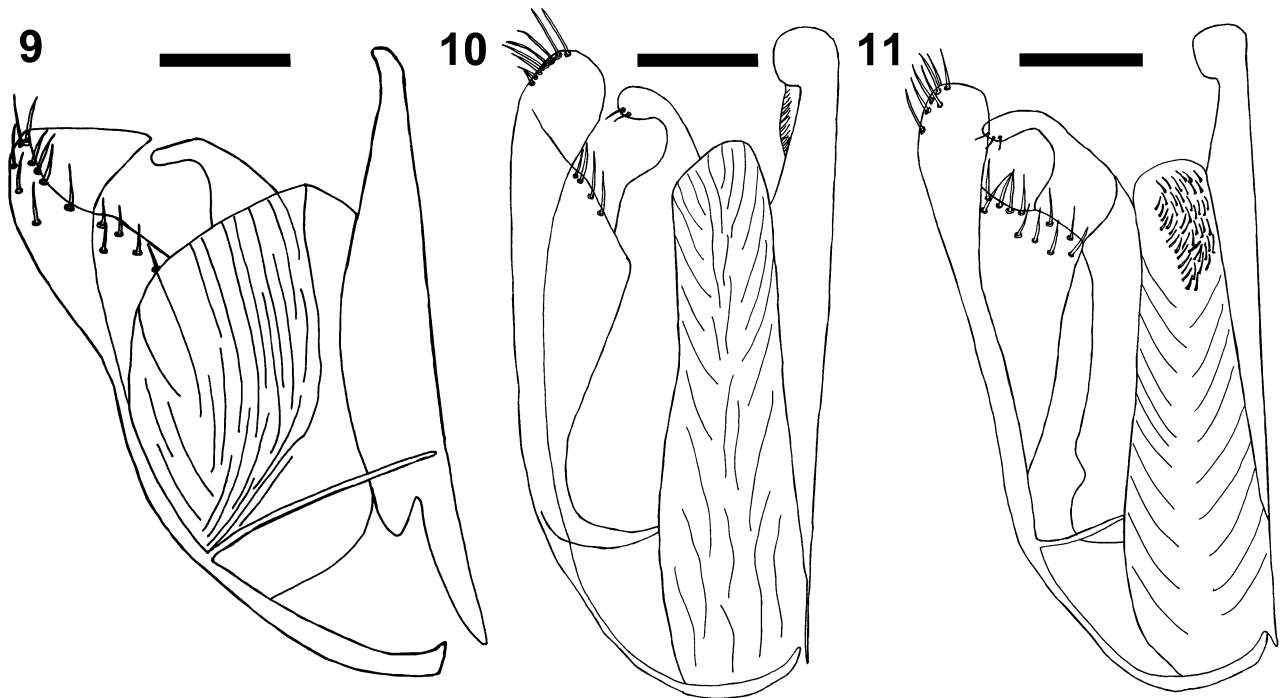
## Key to the species of South Korean *Anteon*

### Females (unknown for *A. pilosum* Xu, Olmi & He)

1. Segment 4 of foretarsus at most about 0.5 as long as segment 1; foretarsal segment 3 or 4 produced into hook . . . . . 2
- Segment 4 of foretarsus as long as, or longer than, or little shorter than segment 1 (in the last case, at least 0.66 as long as segment 1); usually foretarsal segment 2 produced into hook . . . . . 8
2. Posterior surface of propodeum without longitudinal keels . . . . . 7. *A. jurineanum* Latreille
- Posterior surface of propodeum with two longitudinal keels . . . . . 3
3. Segment 5 of foretarsus laterally expanded and forming wide and slightly concave lamina (Fig. 6) . . . . . 15. *A. magnatum* sp. nov.
- Segment 5 of foretarsus normally shaped, not expanded to form wide lamina . . . . . 4
4. Head completely and strongly reticulate rugose; segment 4 and occasionally also segment 3 of foretarsus produced into hook . . . . . 5
- Head not or partly reticulate rugose; segment 3 of foretarsus produced into hook . . . . . 6
5. Notauli reaching about 0.3 length of scutum; head with OOL about as long as OL . . . . . 12. *A. reticulatum* Kieffer
- Notauli reaching about 0.4–0.5 length of scutum; head with OOL much longer than OL . . . . . 3. *A. esakii* Yasumatsu
6. Notauli reaching approximately 0.65–0.80 length of scutum . . . . . 9. *A. medium* Olmi
- Notauli at most reaching 0.3–0.6 length of scutum . . . . . 7
7. Distal part of segment 5 of foretarsus approximately as long as proximal part . . . . . 13. *A. septentrionale* Xu, He & Olmi
- Distal part of segment 5 of foretarsus much shorter than proximal part . . . . . 4. *A. flavicorne* (Dalman)
8. Posterior surface of propodeum without longitudinal keels . . . . . 1. *A. achterbergi* Olmi
- Posterior surface of propodeum with two longitudinal keels . . . . . 9
9. Posterior surface of propodeum with median area shining, mostly smooth and unsculptured or partly rugose. . . . . 10
- Posterior surface of propodeum with median area dull, completely rugose, approximately as rugose as lateral regions . . . . . 11
10. Posterior surface of pronotum transverse, much shorter than scutum . . . . . 8. *A. koreanum* Kim & Lee
- Posterior surface of pronotum as long as, or longer than scutum . . . . . 10. *A. munitum* Olmi
11. Basal part of segment 5 of foretarsus slightly shorter than distal part . . . . . 6. *A. insertum* Olmi
- Basal part of segment 5 of foretarsus much shorter than distal part . . . . . 12
12. Segment 4 of foretarsus about twice as long as segment 1 . . . . . 5. *A. hilare* Olmi
- Segment 4 of foretarsus as long as, or shorter than, or less than twice as long as segment 1 . . . . . 13
13. Pronotum always black; mesosoma totally black; head black, occasionally with face partly testaceous . . . . . 14. *A. takenoi* Olmi
- Pronotum never black; head and mesosoma usually partly or totally testaceous, or yellow, or reddish, never black with face partly testaceous 2. *A. ephippiger* (Dalman)

### Males (unknown for *A. koreanum* Kim & Lee, *A. medium* Olmi, *A. magnatum* sp. nov.)

1. Posterior surface of propodeum without longitudinal keels . . . . . 2
- Posterior surface of propodeum with two longitudinal keels . . . . . 3
2. Paramere with distal inner process . . . . . 1. *A. achterbergi* Olmi
- Paramere without distal inner process . . . . . 7. *A. jurineanum* Latreille
3. Paramere without distal inner more or less pointed process . . . . . 4
- Paramere with distal inner more or less pointed process . . . . . 11
4. Posterior surface of propodeum with median area shining and almost completely smooth, not rugose . . . . . 5
- Posterior surface of propodeum with median area dull and rugose . . . . . 6
5. Proximal membranous process of paramere with inner margin provided of numerous bristles (Fig. 11) . . . . . 11. *A. pilosum* Xu, Olmi & He
- Proximal membranous process of paramere with inner margin not provided of numerous bristles (Fig. 10) . . . . . 10. *A. munitum* Olmi
6. Scutum punctate, unsculptured among punctures, not granulated . . . . . 7
- Scutum granulated, or with anterior half or fourth strongly reticulate rugose and with posterior region strongly punctate . . . . . 10
7. Head shiny, punctate, unsculptured among punctures, at most very slightly rugose on temple and behind ocelli . . . . . 8
- Head more or less reticulate rugose, at most with smooth area in front of anterior ocellus . . . . . 9
8. Head with OOL much longer than POL . . . . . 5. *A. hilare* Olmi
- Head with OOL as long as, or shorter than POL . . . . . 14. *A. takenoi* Olmi
9. Vertex of head behind ocellar triangle not rugose . . . . . 13. *A. septentrionale* Xu, He & Olmi
- Vertex of head behind ocellar triangle slightly rugose . . . . . 6. *A. insertum* Olmi
10. Notauli reaching about 0.5–0.6 length of scutum . . . . . 3. *A. esakii* Yasumatsu
- Notauli reaching about 0.25–0.40 length of scutum . . . . . 12. *A. reticulatum* Kieffer
11. Distal inner process of paramere extended medially and with inner margin excavated . . . . . 4. *A. flavicorne* (Dalman)
- Distal inner process of paramere extended apically and with inner margin convex or straight, rarely slightly excavated (Fig. 9) . . . . . 2. *A. ephippiger* (Dalman)



**FIGURES 9–11.** Male of genitalia in dorsal view (left). 9. *Anteon ephippiger* (CN, Daejeon Univ.); 10. *A. munitum* (GG, Mt. Bukhan National Park); 11. *A. pilosum* (GN, Wangdeungjae). Scale bars: 0.05 mm for 9; 0.1 mm for 10, 11.

## Conclusions

With an area of 100,210 km<sup>2</sup>, South Korea is one of the smallest states of Northeast Asia. In the present paper, 15 species of *Anteon* are listed. A comparison with the closest countries shows the following numbers of *Anteon* species (Kim *et al.* 2012; Lelej 2012; Olmi, pers. comm.; Xu *et al.* 2013): Taiwan (36,193 km<sup>2</sup>): 45; North Korea (120,540 km<sup>2</sup>): 4; Japan (377,944 km<sup>2</sup>): 24; Mongolia (1,564,115 km<sup>2</sup>): 6; Russian Far East (6,200,000 km<sup>2</sup>): 9; China (9,706,961 km<sup>2</sup>): 119. The data show that *Anteon* species are insufficiently known from of South Korea, especially in comparison with smaller Taiwan and justify the necessity of further research of this groupe for the improving our knowledge as well as to establish biological control of leafhopper and planthopper pests of cultivated plants in that area. Dryinidae are efficient natural enemies, so that they are used in biological control programs in many countries (Olm, 1999). In paddy fields of Central America, for example, they are used for the control of the planthopper *Tagosodes orizicolus* (Muir) (Homoptera: Delphacidae), one of the main rice pest in the Neotropics. This planthopper in fact produces severe damage as a phloem feeder, causing mechanical injury during oviposition, and act as a vector of the rice hoja blanca virus (RHBV) (Mora-Kepfer & Espinoza, 2009).

South Korean *Anteon* species includes the species of both Palaearctic (ten species) and Oriental (five species) origin. One species, *Anteon magnatum* **sp. nov.**, is apparently endemic of South Korea.

## Acknowledgments

The authors thank Dr. M. Olmi (Università della Tuscia, Italy) and Dr. Jongok Lim (Korea National Arboretum, Korea) for kindly reading and providing many comments on the manuscripts. Also, would like to thank the anonymous reviewer and A.S. Lelej, subject editor, for their valuable comments and suggestions to improve the quality of the paper. Dr. Jong-Chul Jeong (National Park Research Institute, Korea), Prof. K. Yamagishi (Meijo University, Japan) and Dr. T. Mita (Tokyo University of Agriculture, Japan) for providing valuable specimens. We also thank Dr. Andrew M. R. Bennett (Canadian National Insect Collection, Canada), Dr. Chi-Feng Lee (Taiwan Agricultural Research Institute Insect Collection, Taiwan) and Dr. Hege Vårdal (Swedish Museum of Natural

History) for providing the type specimens. This study was supported by the project of the Insect Diversity in Northeast Asia of the National Institute of Biological Resources (NIBR) under the Ministry of Environment, Korea (1834-302).

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