

New records and species to the Korean springtail (Collembola) fauna

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ABSTRACT: North Korean occurrence data of 20 Collembola species are given. Eight of them are new to the fauna of the Korean Peninsula: *Ceratophysella sigillata* (Uzel, 1891), *Entomobrya japonica* Uchida, 1954, *Isotomiella minor* (Schäffer, 1896), *Ptenothrix marmorata* (Packard, 1873), *Semicerura goryshini* Martynova, 1969, *Sminthurinus igniceps* (Reuter, 1878), *Sminthurinus trinotatus* Axelson, 1905 and *Sphaeridia pumilis* (Krausbauer, 1898). Illustrations and short description are given of these species. The genera *Semicerura* Maynard, 1951 and *Sphaeridia* Linnaniemi, 1912 are reported for the first time from Korea. Another two species, recorded already in South Korea, are new to the fauna of North Korea: *Homidia heugsanica* Lee & Park, 1984, and *Isotoma viridis* Bourlet, 1839.

Introduction

Research on the Collembola fauna of Korean Peninsula started in the 1930s (KINOSHITA 1934). Since that, about one hundred publications have been published on the springtails of the region listing around 230 species.

The Soil Zoological Collection of the Hungarian Natural History Museum is rich in unsorted Berlese samples collected in both countries of the Korean Peninsula. There are around 200 Korean samples housed in the collection, which represent the mesofauna of different habitats and microhabitats (e.g. soil, moss and leaf litter). From several of these samples, all the springtail specimens have been sorted out in the 1990s and sent to the renowned Korean specialist, Byung Hoon LEE for identification by courtesy of the previous curator of the collection, Sándor MAHUNKA. Thus, some articles have already been published from this material (LEE & PARK 1992, LEE et al. 1993) but even the remaining unsorted part is promising for further studies. The first results from the investigation of this material are presented here.

Material and methods

For light microscopy, specimens were cleared in a mixture of lactic acid and glycerol (3:1), and examined under a Leica DM 1000 microscope with phase contrast optics. For using 1000x magnification with oil immersion, specimens were mounted in Hoyer's medium on permanent slides. Dark specimens were depigmented with Hüther's fluid. Line drawings were prepared with a drawing tube. Photographs were taken with a Nikon CoolPix900 digital camera.

The specimens examined are deposited in the Soil Zoology Collection of Hungarian Natural History Museum (Budapest, Hungary) (HNHM) and in the National Institute of Biological Resources, Incheon, Republic of Korea (NIBR).

For the species already known from the Korean Peninsula, their first North and/or South Korean report is cited under 'Distribution'.

Abbreviations: Ant I–IV = antennal segments I–IV, Abd I–VI = abdominal terga I–VI, Tita I–III = tibiotarsus I–III, Emp = empodium, App. an. = appendices anales, PAO = postantennal organ. *Collectors:* SH = Henrik Steinmann, VT = Tamás Vásárhelyi, FL = László Forró, TG = György Topál, RL = László Ronkay, KZ = Zoltán Korsós, KD = Dezső Kováts, SG = György Szollát, MO = Ottó Merkl, SzG = Győző Szél, LL = László Lőkös, ST = Tibor Szerdahelyi.

Results

PODUROMORPHA HYPOGASTRURIDAE Börner, 1906

Ceratophysella armata (Nicolet, 1841) – North Pyongan Prov., Mt. Myohyang-san, pathway Sangwon-am, sifted litter extracted by Moczarsky–Winkler funnel, 09.10.1987, leg. KZ-RL-KD-SG (Korea 1987/1029); – Kangwon Province, Kumgang-san Onjong-ri, pitfall traps, 17.06.1988, leg. MO-SzG-LL-ST (Korea 1988/1338) (As-572). – Holarctic, may be cosmopolitan species (THIBAUD et al. 2004). Already known from South Korea (LEE 1974) and North Korea (LEE & THIBAUD 1975).

Ceratophysella duplicispinosa (Yosii, 1954) – Kangwon Prov., Mt. Kumgang-san, pathway Kuryong, sifted litter extracted by Moczarsky–Winkler funnel, 21.10.1987, leg. KZ-RL-KD-SG (Korea 1987/1059). – Occurs in SE Asia, Russia (THIBAUD et al. 2004), South Korea (LEE 1974) and North Korea (LEE & THIBAUD 1975).

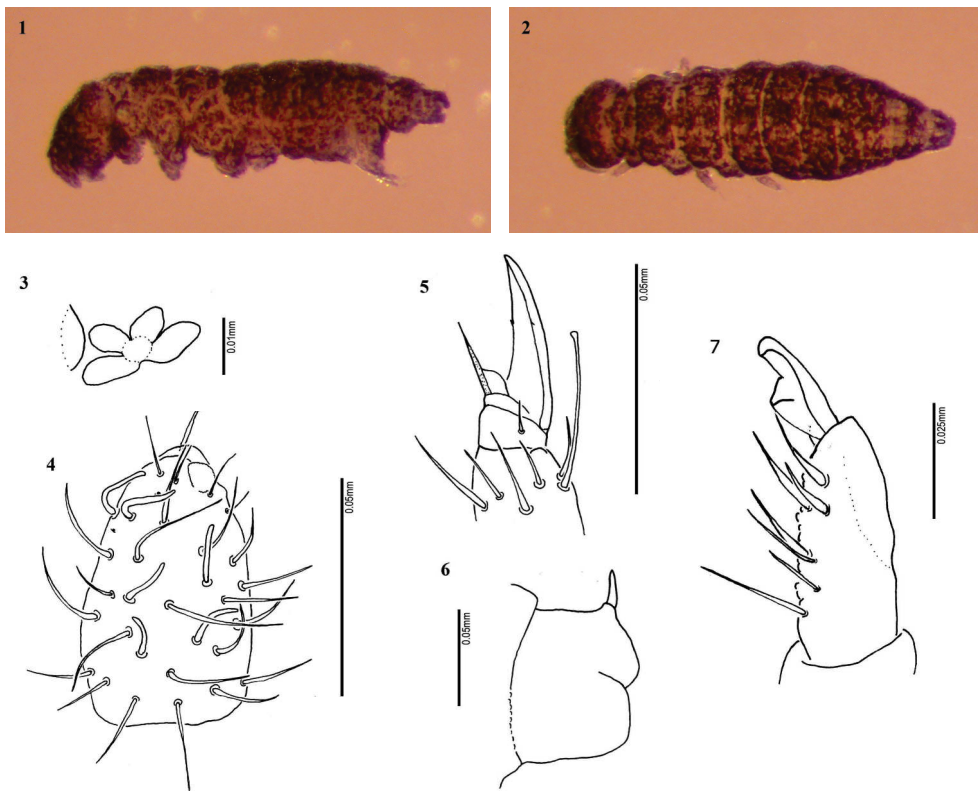
Ceratophysella sigillata (Uzel, 1891) – Kangwon Province, Kumgang-san Onjong-ri, pitfall traps, 17.06.1988, leg. MO-SzG-LL-ST (Korea 1988/1338) (As-572). – New to the Korean Peninsula.

Short description of the Korean specimens – Habitus and colour as in Figs 1–2. Length ~0.9 mm without furca and antennae. Tegumentary granulation fine and uniform. 18–19 granules between the p1 setae on Abd V. Eversible sac between Ant III and IV present in one specimen, not detectable in the other one. Ant IV with simple apical bulb, 6 dorsal sensilla (Fig. 4) and ventral sensory file of 7–9 hook-like sensilla. PAO as in Fig. 3. Tita I–III each with one knobbed tenent hair, claws with one internal and one lateral tooth (Fig. 5). Dens with 7 setae, 4 of the internal setae thickened (Fig. 7). Mucro as in Fig. 7. Anal spines as in Fig. 6. Chaetotaxy of type B. Micro- and macrosetae distinctly differentiated. Sensilla longer than microsetae on all tergites, posterior microsetae smooth.

Remark on morphology – Our specimens fit well the description of *Ceratophysella sigillata* given by THIBAUD et al. (2004).

Type locality – Bohemia, Hradec Králové (Czech Republic).

Remarks – A Holarctic species (THIBAUD et al. 2004) also known from Russia (STEBAEVA 2003). A key to the known Korean *Ceratophysella* species was published and a closely related species, *Ceratophysella biclavata* Park & Park, 2006 was described from South Korea by PARK & PARK (2006).



Figs. 1–7. *Ceratophysella sigillata* (Uzel, 1891): 1 = habitus, lateral view (without scale); 2 = habitus, dorsal view (without scale); 3 = PAO; 4 = Ant IV (dorsal view); 5 = Claw 1; 6 = anal spine (lateral view); 7 = dens and mucro

ENTOMOBRYOMORPHA

ENTOMOBRYIDAE Schäffer, 1896

Entomobrya japonica Uchida, 1954 – Chagan Prov., Mt. Myohyang-san, sample of moss growing on a big stone close Lyongyon waterfall, extracted in Berlese-funnel, 13.09.1980, leg. FL-TG, 590 m a.s.l. (Korea 1980/657) (As-426). – New to the Korean Peninsula.

Short description of the Korean specimen – Body colour pattern as in Fig. 8. Length about 1 mm excluding antennae. Antennal length about 600 μ m. Relative length of Ant I/II/III/IV = 1/1.5/1.5/2.3. 8 Ommatidia. Length ratio of Abd IV/III > 4. Claw with four teeth on internal edge, dorsal tooth absent, Emp with smooth external edge on leg III. Furca length about 650 μ m. Mucro with 2 teeth (antero-apical bigger than apical one), mucronal spine present. Simplified chaetotaxy formula: 3-1-0-3-2/2-3/2-1/1-2-0/?.

Remarks on morphology – The original description is rather short and thus YOSII (1977) cited the species as a *species inquirenda*. However, JORDANA (2012) considered it as a good



Fig. 8. *Entomobrya japonica* Uchida, 1954 colour pattern (dorsal view, not to scale).

species based on the colour and the relative measurements of the drawings in UCHIDA (1954a). Our specimen shows the colour of *E. japonica* which is really distinct. The only one species with similar coloration is *E. multifasciata*, from which our specimen differs in relative measurements and in chaetotaxy. The smaller size of the Korean specimen is probably related to its subadult stage. Several characters which were not mentioned in the original description of *E. japonica*, could not be documented on the Korean specimen, either. Thus, to reveal the shape of the labral papillae and the Abd IV chaetotaxy, study on further specimens is needed.

Type locality – Higashiyama, Japan.

Biogeographical remark – The species has been, till now, only known from the Japanese Island Honshu (UCHIDA 1954a). Its new record from North Korea suggests, that *E. japonica* might well occur and will be found in South Korea, too.

Entomobrya leeparkae Jordana, 2012 – Kangwon Prov., Mt. Kumgang-san, near Hotel Kumgang, singled and netted, 27.09.1979, leg. SH-VT (Korea 1979/590). – Known only from the type locality from where also our specimens have been collected. Described originally as *Entomobrya minuta* Lee & Park, 1992.

Entomobrya nana Lee & Park, 1992 – North Pyongan Prov., Mt. Myohyang-san, pathway Isonnam, sifted from litter, 11.10.1987, leg. KZ-RL-KD-SG (Korea 1987/1035). – Known only from North Korea (LEE & PARK 1992).

Entomobrya pulcherrima Yosii, 1942 – Kangwon Prov., Mt. Kumgang-san, Hotel Kumgang, soil traps, 20.09.1980, leg. FL-TG (Korea 1980/724). – Reported from Japan, South Korea (YOSII & LEE 1963) and North Korea (LEE & PARK 1992).

Homidia heugsanica Lee & Park, 1984 – Kangwon Prov., Mt. Kumgang-san, Hotel

Kumgang, soil traps, 20.09.1980, leg. FL-TG (Korea 1980/724); – North Pyongan Prov., Mt. Myohyang-san, stream Hyangsan, extracted from litter by Moczarsky–Winkler funnel, 08.10.1987, leg. KZ-RL-KD-SG (Korea 1987/1026). – New to North Korea. Till now, it has only been known from South Korea (LEE & PARK 1984).

Homidia speciosa Szeptycki, 1973 – Kangwon Prov., Mt. Kumgang-san, Hotel Kumgang, soil traps, 20.09.1980, leg. FL-TG (Korea 1980/724); – North Pyongan Prov., Mt. Myohyang-san, stream Hyangsan, extracted from litter by Moczarsky–Winkler funnel, 08.10.1987, leg. KZ-RL-KD-SG (Korea 1987/1026); – North Pyongan Prov., Mt. Myohyang-san, pathway Isonnam, sifted from litter, 11.10.1987, leg. KZ-RL-KD-SG (Korea 1987/1035); – North Pyongan Prov., Mt. Myohyang-san, behind Hotel Myohyang-san, pitfall traps, 19.07.1982, leg. FL-RL (Korea 1982/841). – Only known from North Korea (SZEPTYCKI 1973).

ISOTOMIDAE Schäffer, 1896

Folsomia octoculata Handschin, 1925 – North Pyongan Prov., Mt. Myohyang-san, stream Hyangsan, extracted from litter by Moczarsky–Winkler funnel, 08.10.1987, leg. KZ-RL-KD-SG (Korea 1987/1026); – Kangwon Prov., Mt. Kumgang-san, pathway Kuryong, sifted litter extracted by Moczarsky–Winkler funnel, 21.10.1987, leg. KZ-RL-KD-SG (Korea 1987/1059). – Occurs in Eastern Asia and Hawaii (POTAPOW 2001). Already reported from South Korea (LEE 1973) and North Korea (LEE et al. 1993) as well.

Isotoma viridis Bourlet, 1839 – Kangwon Prov., Mt. Kumgang-san, pathway Kuryong, sifted litter extracted by Moczarsky–Winkler funnel, 21.10.1987, leg. KZ-RL-KD-SG (Korea 1987/1059). – New to North Korea. Holarctic species (POTAPOW 2001), already reported from South Korea (YOSII & LEE 1963).

Isotomiella minor (Schäffer, 1896) – Kangwon Prov., Mt. Kumgang-san, foot-path to Kuryong Falls, litter sample extracted in Berlese-funnel, 18.09.1980, leg. FL-TG (Korea 1980/700) (As-429). – New to the Korean Peninsula.

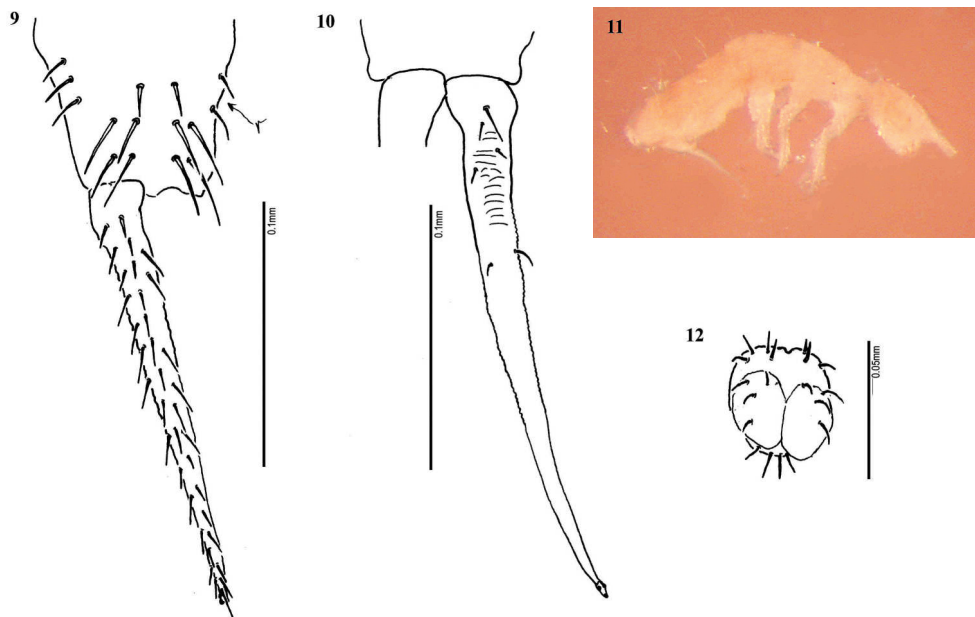
Short description of the Korean specimens – Habitus as in Fig. 11. Labrum not modified, with 4/5, 5, 4 setae. Maxillary palp bifurcate, 4 sublobal hairs. Tita without spinelike setae. Subcoxa I with 1, 3, 3 setae. Claw untoothed, Emp rather broad. VT with 2+2 posterior, 4(3)+4 anterior and 4+4 laterodistal setae (Fig. 12). Ret with 4+4 teeth and one seta. Man with 5+5 anterior and 3(2)+3 lateral setae (Fig. 9). Dens long, with about 36 anterior and 6 posterior setae (Fig. 10). Mucro tridentate. Axial chaetotaxy 20, 14/6, 6, 6, 6. Mac long, ciliate. – Our specimens agree well with the description given by POTAPOW (2001).

Type locality – Hamburg, Germany.

Biogeographical remark – A cosmopolitan species, recorded almost everywhere, but its tropical data are questionable (POTAPOW 2001). The species is known also from the far east of Russia and from Japan (YOSII 1977). A closely allied species, *Isotomiella madeirensis* Gama, 1959 was reported from South Korea by LEE (1977).

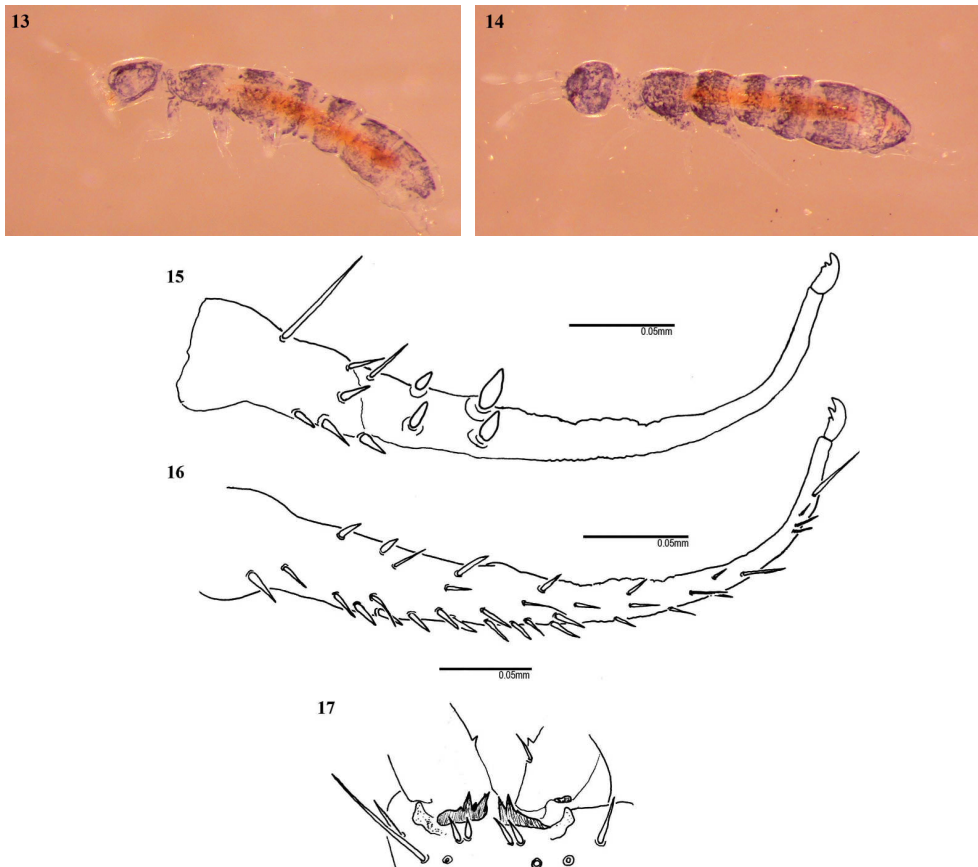
Semicerura goryshini Martynova, 1969 – Kangwon Prov., Mt. Kumgang-san, pathway Kuryong, sifted litter extracted by Moczarsky–Winkler funnel, 21.10.1987, leg. KZ-RL-KD-SG, (Korea 1987/1059). – Genus and species new to the Korean Peninsula.

Short description of the Korean specimens – Habitus as in Figs 13–14. Length 1.9–2 mm without furca and antennae. With spotty black pigment except femur and tita of legs, antennae



Figs. 9–12. *Isotomiella minor* (Schäffer, 1896): 9 = furca (anterior); 10 = furca (posterior); 11 = habitus (not to scale, antennae broken); 12 = VT (ventral view)

and furca (Figs 13–14). 6+6 ommatida with 4 in anterior group and two in a distance (Fig. 18). PAO about twice as long as ommatida (Fig. 18). Claw with lateral and inner teeth, empodium about 2/3 length of the claw. VT with 8+8 laterodistal setae and 5+5 anterior setae (Fig. 19). Manubrium on anterior side with 5+5 setae in distal row, 2+2 of them as short stout setae near medial line (Fig. 17). Manubrial thickening with 4–5 unequal teeth in median part (Fig. 17). Dens with spines and setae as in Figs 15–16, anterior side slightly wrinkled, posterior side crenulated beyond the posterior spines. Mucro tridentate, but the size of the basal tooth seems to vary (hardly discernible in one of the specimen). Abd V and VI fused (Figs 13–14). *Remarks on morphology* – There are some differences between the Korean specimens and the original description. However, the taxonomical importance of these differences is still unclear. According to the original description, the specimens from Vladivostok have 5+5 ommatida, while both Korean specimens have 6+6. Since the most posterior ommatidium is very minute in our specimens, it might have been overlooked by Martynova. The segments Abd V and VI are fused in the Korean specimens, while they should be separate according to the original description. At the time of the description of *S. goryshini*, another species of the genus (*Semicerura bishopi* Maynard, 1951, reported also by MARTYNOVA (1969) from Russia) was considered similarly as having separate Abd V and VI. In the case of *S. bishopi*, a revision of the type material revealed that it has fused Abd V and VI which is probably the common stage for the whole genus and the separate stage of the two segments might be a misinterpretation. The macrosetae in the Korean specimens are all smooth instead of serrate as in the original description. This character is however probably affected by the age, and the difference is based on the subadult stadium of our specimens.



Figs. 13–19. *Semicerura goryshini* Martynova, 1969: 13 = habitus, lateral view (without scale); 14 = habitus, dorsal view (without scale); 15 = posterior side of dens and mucro; 16 = anterior side of dens and mucro; 17 = distal end of manubrium (anterior view); 18 = PAO and eyes (lateral view); 19 = VT (lateral view)

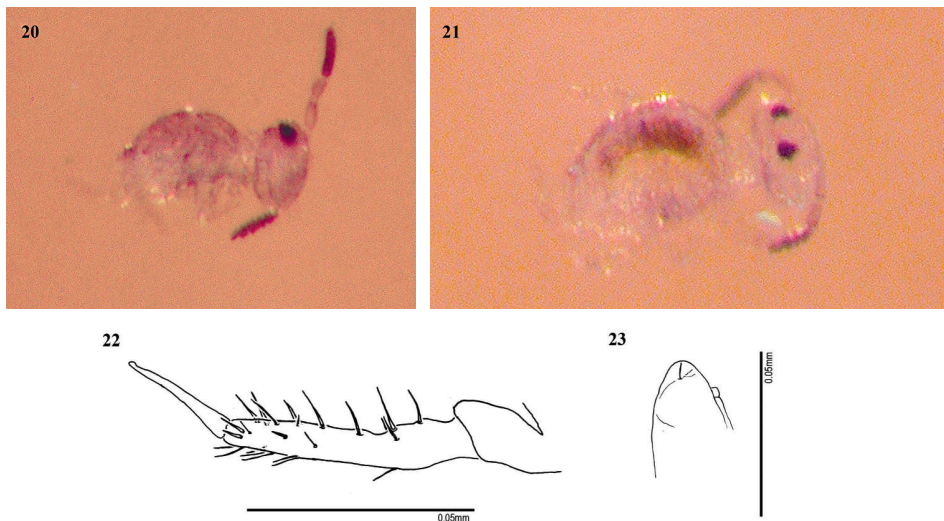
Type locality – Russia (S Far East), environs of Vladivostok.

Biogeographical remark – *Semicerura goryshini* has been known only from its type locality till now. The presence of this species in Korea is not surprising, since the type locality of this species is situated only a few hundred kilometres from the Korean border and from our collecting localities.

SYMPHYPLEONA

SMINTHURIDIDAE Börner, 1906

Sphaeridia pumilis (Krausbauer, 1898) – North Pyongan Prov., Mt. Myohyang-san, behind Hotel Myohyang-san, pitfall traps, 19.07.1982, leg. FL-RL (Korea 1982/841). – Genus and species new to the Korean Peninsula.



Figs. 20–23. *Sphaeridia pumilis* (Krausbauer, 1898): 20 = male (habitus, without scale); 21 = female (habitus, without scale); 22 = furca (lateral view); 23 = VT (lateral view)

Short description of the Korean specimens – Habitus as in Figs 20–21. Male 0.24 mm, female 0.25 mm without furca and antennae. Female without App. an., male with modified (clasping organ) antennae. Head, Ant I and II, and thorax with normal setae (forma *principalis*). Ant II and III without flame shaped spines and Ant III with 1 long distal seta of antennal organ in male. Posterior side of VT with 1 pair of small vesicles (Fig. 23). Ret with 2 setae. Dens row J:3+1 setae, anterior setae as 2,3,2...1 (Fig. 22). Mucro long and slender without lamellae, inner edge with teeth. – The Korean specimens fit well both to the description of BRETFFELD (1999) and to the European specimens examined by us.

Type locality – Germany, Hesse, Kissel near Weilburg/Lahn.

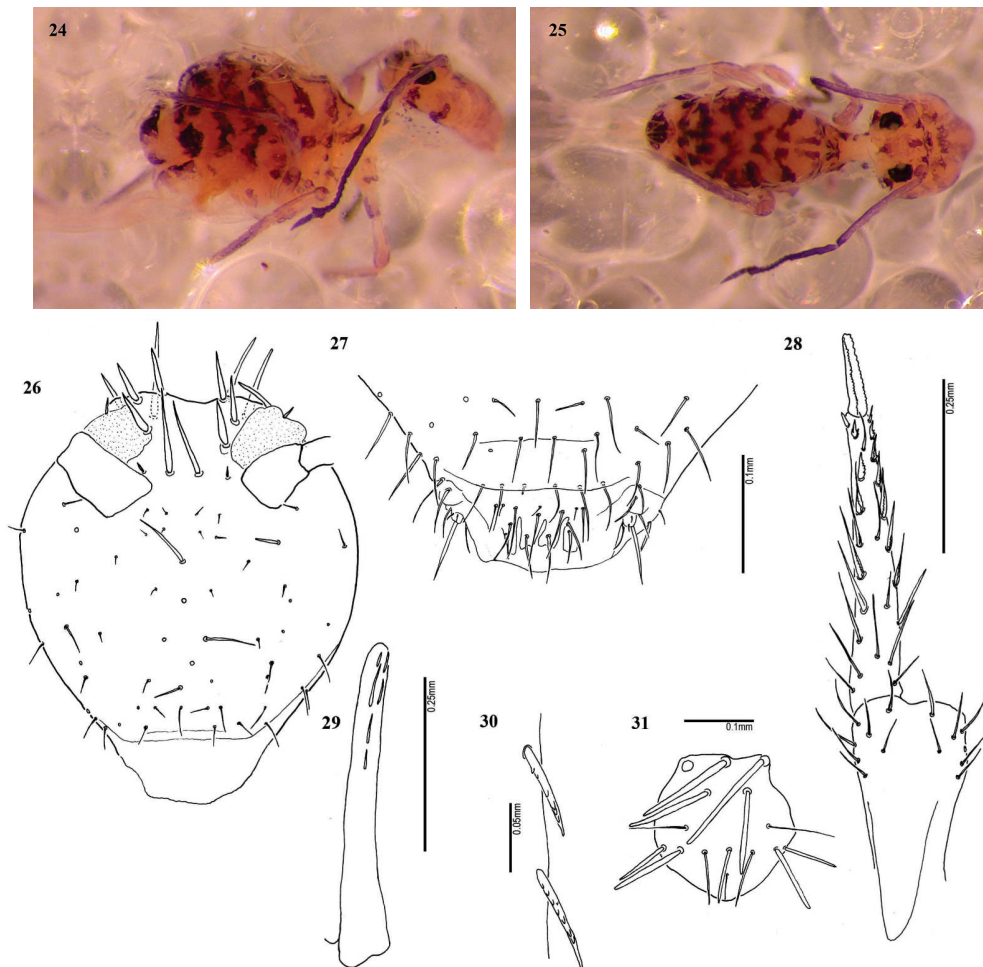
Biogeographical remark – *Sphaeridia pumilis* has been reported from the Holarctic, Africa, South America and Australia, thus it seems to be a cosmopolitan species (BRETFFELD 1999). It has been reported also from Japan (TANAKA et al. 1978) and China (ZHAO et al. 1997). Thus, the presence of the species in Korea could be expected but the minute size of the specimens has probably hindered its finding till now.

DICYRTOMIDAE Börner, 1906

Bothriovulsus kymgangensis Weiner & Betsch, 1992 – Kangwon Prov., Mt. Kumgang-san, Hotel Kumgang, soil traps, 20.09.1980, leg. FL-TG (Korea 1980/724). – Known only from the type locality (Kumgang-san) from where our specimens have also been collected.

Bothriovulsus sohungensis Weiner & Betsch, 1992 – South Pyongan Prov., Mt. Lyong-aksan 15 km W of Pyongyang, litter sample extracted in Berlese-funnel, 09.09.1980, leg. FL-TG (Korea 1980/622) (As-419). – Known only from North Korea (WEINER & BETSCH 1992).

Ptenothrix marmorata (Packard, 1873) – Kangwon Prov., Mt. Kumgang-san, Hotel Kumgang, pitfall traps, 20.09.1980, leg. FL-TG (Korea 1980/724). – New to the Korean Peninsula.



Figs. 24–31. *Ptenothrix marmorata* (Packard, 1873): 24 = habitus (lateral view, without scale); 25 = habitus (dorsal view, without scale); 26–27 = head chaetotaxy (frontal view); 28 = furca (posterior); 29 = dens (anterior); 30 = modified chaetae of Tita III; 31 = circumanal chaetae of dorsal valve (posteriodorsal view)

Short description of the Korean specimens – Habitus and colour as in Figs 24–25. Chaetotaxy of head as in Figs 26–27. Differentiated tibiotarsal chaetae moderately serrate, as in Fig. 30. Tenent hairs acuminate. Furcal chaetotaxy as in Figs 28–29, chaeta E2 strongly serrate. Both edges of mucro finely serrate (Fig. 28). Claw with 2 lateral and 2 inner teeth. Female App. an. smooth, weakly curved and acuminate; anal chaeta sa not spinelike, smaller than A_0 (Fig. 31). – Our specimens fit to the descriptions and illustrations given by CHRISTIANSEN & BELLINGER (1998) and UCHIDA (1954b).

Type locality – Brunswick, Maine, USA.

Biogeographical remark – *Ptenothrix marmorata* was described from North America and it occurs there from Mexico till Canada (CHRISTIANSEN & BELLINGER 1998). In the Palearctic

Region it has only been recorded in Japan till now (UCHIDA 1954b) although these records were questioned later by YOSII (1977). The Korean population confirms the trans-Pacific distribution of the species. Its new record from North Korea suggests, that *P. marmorata* might occur in South Korea, too.

SMINTHURIDAE Lubbock, 1862

Sphyrotheca koreana Betsch & Weiner, 2009 – South Pyongan Prov., Mt. Lyong-ak-san 15 km W of Pyongyang, litter sample extracted in Berlese-funnel, 09.09.1980, leg. FL-TG (Korea 1980/622) (As-419). – North Korea (BETSCH & WEINER 2009).

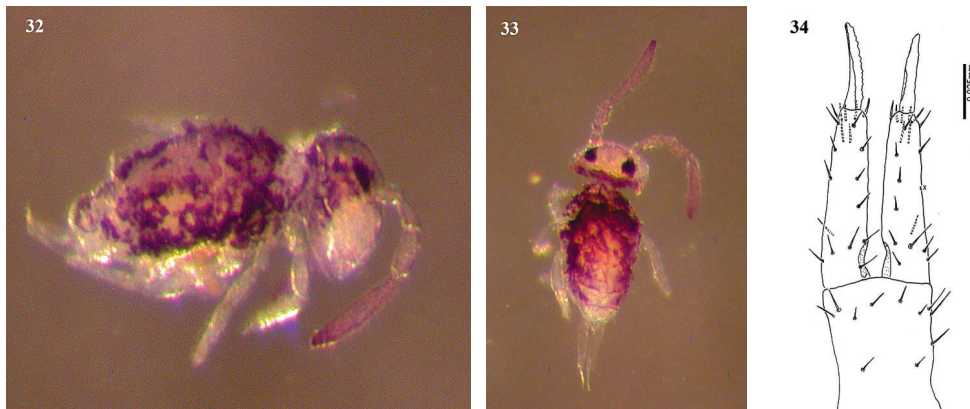
KATIANNIDAE Börner, 1913

Sminthurinus igniceps (Reuter, 1878) – Chagan Prov., Mt. Myohyang-san, sample of moss growing on a big stone close Lyongyon waterfall, extracted in Berlese-funnel, 13.09.1980, leg. FL-TG, 590 m a.s.l. (Korea 1980/657) (As-426). – New to the Korean Peninsula.

Short description of the Korean specimens – Habitus as in Figs 32–33. Body and head back blueish black, legs, furca and other parts of head white. Ant IV weakly pigmented. Length 0.44 mm without furca and antennae. Abd V partially included in small abdomen. 8+8 ommatidia. Ant III with small papilla. Each Tita with 5 spatulate setae. Emp I with long filament (length = claw), Emp II with short filament (shorter than claw), Emp III without filament. Ret with 2 setae. Dens with 2 anterior subapical setae, posterior setae 5 proximal and 2 outer and 3 median subapical setae (Fig. 34). Both edges of mucro serrate (Fig. 34).

Remarks on morphology – The Korean specimens fit well with the description of BRETTFELD (1999). Emp have not been documented before (BRETTFELD 1999), they are not like the typical in *niger*-group, but much more similar to those in *S. trinotatus* which is indeed the closest species to *S. igniceps* differing only in colouration and the number of setae on Ret.

Type locality – Finland, Helsinki (orangery).



Figs. 32–34. *Sminthurinus igniceps* (Reuter, 1878): 32 = habitus (lateral view); 33 = habitus (dorsal view); 34 = furca (posterior view, anterior setae marked striped); Figs. 32–33 with specimen cleared partially with lactic acid-glycerol mixture, not to scale

Biogeographical remark – Although widely distributed in the Palearctic Region, *Sminthurinus igniceps* seems to be an indoor species in Europe (BRETFFELD 1999), while it was found in natural habitat in Japan (YOSII 1970) and now, in Korea.

Sminthurinus trinotatus Axelson, 1905– Chagan Prov., Mt. Myohyang-san, sample of moss growing on a big stone close Lyongyon waterfall, extracted in Berlese-funnel, 13.09.1980, leg. FL-TG, 590 m a.s.l. (Korea 1980/657) (As-426). – New to the Korean Peninsula.

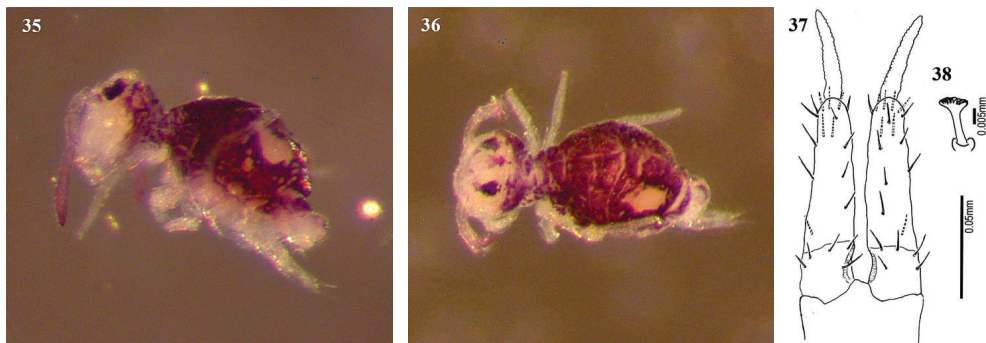
Short description of the Korean specimens – Habitus and coloration as in Figs 35–36. Dorsal and posterior part of the head, dorsal and lateral part of the large abdomen, and dorsal part of small abdomen darkly pigmented except in two spots between the eyes and in two large spots on the large abdomen posterolaterally which are white. Legs, furca and ventral part of head and body white, antennae weakly pigmented. Length 0.6 mm without furca and antennae. Abd V included in small abdomen. 8+8 ommatidia. Ant III with small papilla. Each Tita with 5 spatulate setae. Emp I with long filament (length = claw), Emp II with short filament (shorter than claw), Emp III without filament. Ret with 1 seta. Dens with 2 anterior subapical setae, posterior setae 5 proximal and 2 outer and 3 median subapical setae (Fig. 37). Both edges of mucro serrate (Fig. 37). App. an. with several branches distally (Fig. 38). – The Korean specimen fits well to the descriptions by BRETFFELD (1999) and STACH (1956).

Type locality – Finland, Oulu (from greenhouses).

Biogeographical remark – *S. trinotatus* is widely distributed in the Palearctic Region, and has already been reported from NE China and Japan, too (BRETFFELD 1999). Thus, the presence of the species in Korea is not surprising.

Discussion

Among the 20 Collembola species found, there are 7 (*Entomobrya leeparkae*, *E. nana*, *Homidia heugsanica*, *H. speciosa*, *Bothriovulsus kymgangensis*, *B. sohungensis*, *Sphyrrotheca koreana*) which are seemingly endemic to the Korean Peninsula. However, we have to consider this categorisation with high caution, because the neighbouring continental region



Figs. 35–38. *Sminthurinus trinotatus* Axelson, 1905: 35 = habitus (lateral view);
36 = habitus (dorsolateral view);
37 = furca (posterior view, anterior setae marked striped); 38 = App. an. (dorsal view)

is under-investigated and further research might prove wider distribution in the case of the species. Also one of the species new to the Korean fauna (*Semicerura goryshini*) occurs in the close corner of Russia as well, and probably has a broader distribution covering the adjacent part of China. Five other species from the 8, having been found as new to the Korean Peninsula, are rather widespread, cosmopolitan (*Sphaeridia pumilis*, *Isotomiella minor*) or distributed throughout the Palearctic (*Sminthurinus igniceps*, *S. trinotatus*) or Holarctic Regions (*Ceratophysella sigillata*); one species (*Ptenothrix marmorata*) has trans-Pacific distribution while another one (*E. japonica*) is known in addition to Korea only from an nearby Japanese island.

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