

Two New Records of Soil-inhabiting Mesostigmatic mites (Acari: Mesostigmata) in Korea

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한국의 중기문응애류(응애아강: 중기문응애목) 미기록 2종 보고

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ABSTRACT: In this study, two mesostigmatic mites, *Holostaspella crenulata* Krantz, 1967 (Macrochelidae) and *Lasioseius floridensis* Berlese, 1916 (Blattisociidae) are recognized in Korea for the first time. The diagnoses, distributional data, drawing plates, and microscopic photographs are provided for each species.

Key words: Blattisociidae, Macrochelidae, *Lasioseius floridensis*, *Holostaspella crenulata*, New record

초록: 본 연구를 통해 국내에 분포하는 중기문응애류 중 파리에과의 *Holostaspella crenulata* Krantz, 1967 (툽니무늬파리응애, 신칭) 와 화살응애과의 *Lasioseius floridensis* Berlese, 1916 (가슴선화살응애, 신칭) 를 처음으로 확인하고, 각 종에 대한 분류학적 진단과 분포정보, 성충의 현미경사진과 도판을 제시하였다.

검색어: 화살응애과, 파리응애과, 툽니무늬파리응애(신칭), 가슴선화살응애(신칭), 미기록종

The order Mesostigmata includes 180 families, 869 genera, 11,408 species worldwide (Beaulieu et al., 2011), with 307 species of 111 genera and 33 families recorded in Korea (NIBR, 2021). The genus *Holostaspella*, which belongs to the family Macrochelidae, has over 30 species worldwide (Hartini and Takaku, 2010), but only two species, *H. ornata* (Berlese, 1904); *H. scatophila* Takaku, 1994 have been recorded in Korea (Lim and Lee, 2005; Hartini and Takaku, 2010; Keum et al., 2016). Most of Macrochelid mites are associated with carrion insects (Krantz, 1962a; Takaku, 1994; Hartini and Takaku, 2003; Arriaga-Jimenez et al., 2014; Knee, 2017), however, some species of *Holostaspella* has been observed from leaf-litters,

pasture, and fungus (Krantz, 1967; Halliday, 1988, 2000; Plumari, 2010; Takaku et al., 2012; Özbek, 2017).

The genus *Lasioseius*, which belongs to the family Blattisociidae, includes 206 species worldwide, with five species, (*L. furcisetus* Athias-Henriot, 1959; *L. porulosus* De Leon, 1963; *L. sugawarai* Ehara, 1964; *L. tomokoae* Ishikawa, 1969; *L. yousefi* Athias-Henriot, 1959) reported in Korea (Lee and Lee, 1998; Kontschán et al., 2015; Faraji, 2021). Among those Korean species, *L. lasiodactyli* Ishikawa, 1969 was synonymized with *L. yousefi* Athias-Henriot, 1959 by Christian and Karg (2006). Although this genus is typically free-living, they have also been found in grasslands, upper soil, crop fields, and even animal nests (Christian and Karg, 2006). In this study, we report two new record species, *H. crenulata* Krantz, 1967, and *L. floridensis* Berlese, 1916, along with diagnoses and illu-

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rations. Additionally, key to the Korean species of each genus is also provided.

Material and Methods

The samples were separated from the leaf-litters and insect-rearing cage by using Berlese-Tullgren funnel trap (60 W, 48 h). Mites were cleared in lactic acid with 70°C of dry bath and mounted in PVC medium (Downs, 1943). The identifications and capturing digital images of the specimens were performed with Olympus BX53 DIC (differential interference contrast) microscope with Olympus DP27 camera and Cellsens standard 3.1 software. Line drawing plates were prepared with Adobe Illustrator CC 22.0.1 program based on digital images. The length of all shields was measured from the anterior-median peaks to the posterior-median peaks, and the width was taken from the widest margin of the shields, respectively. The length of the legs was measured from coxa to the apex of the tarsus, excluding the pre-tarsus. The nomenclature used for the dorsal chaetotaxy follows Lindquist and Evans (1965), the other morphological terms follow Evans (1963), Evans and Till (1979), and Krantz and Walter (2009).

The specimens examined are deposited at the National Institute of Biological Resources (NIBR) and the Insect Biosystematics Lab., Seoul National University (SNU), Seoul, Republic of Korea.

Systematic Accounts

Family Macrochelidae Vitzthum, 1930

Genus *Holostaspella* Berlese, 1903

Holostaspella Berlese, 1903: 241.

Prholaspina Berlese, 1918: 175.

Areolaspis Trägårdh, 1952: 61.

***Holostaspella crenulata* Krantz, 1967** 툽니무늬파리응애(신칭) (Figs. 1-3)

Holostaspella crenulata Krantz, 1967: 151.

Diagnosis. Female. Body orange-colored, circular shape, 527-641 μm in length, 495-504 μm in width. Dorsal shield

without anterior projection, bearing 28 pairs of slightly pectinated setae (41-63 μm) (Fig. 1A). Sternal setae smooth

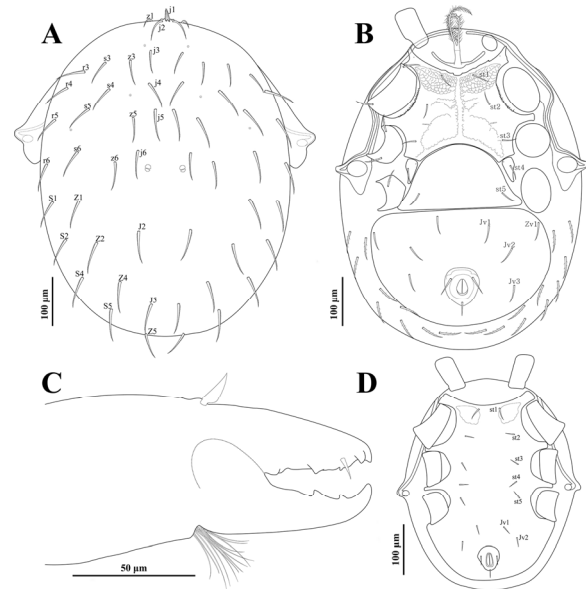


Fig. 1. line drawing plates of *Holostaspella crenulata* Krantz. A, female dorsum; B, female venter; C, female chelicera; D, male venter. Scale bar for A, B, and D = 100 μm; C = 50 μm.

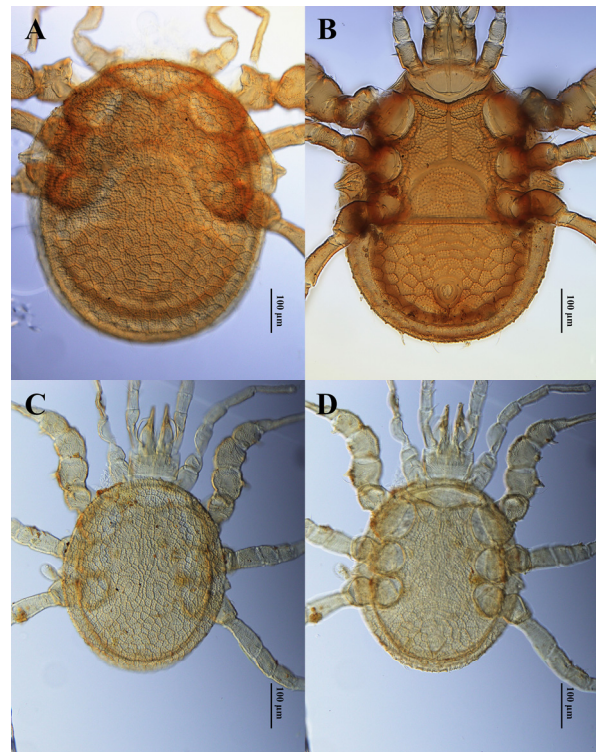


Fig. 2. micro-photographs of *Holostaspella crenulata* Krantz. A, female dorsum; B, female venter; C, male dorsum; D, male venter. Scale bar for A-D = 100 μm.

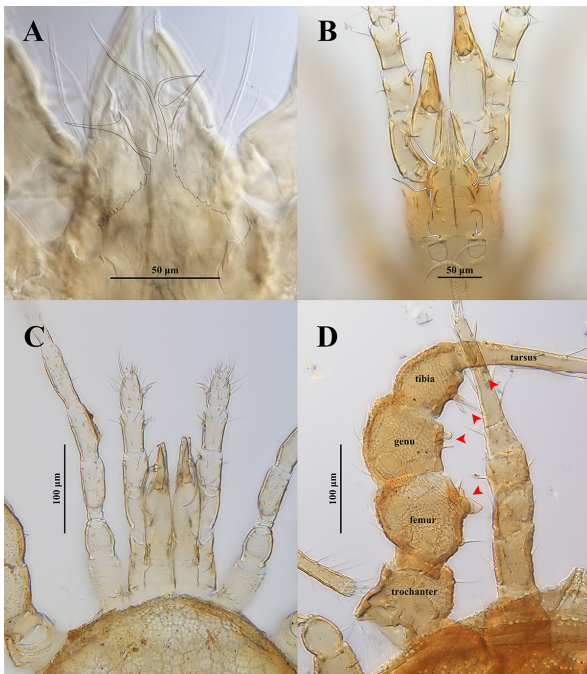


Fig. 3. micro-photographs with a line drawing of *Holostaspella crenulata* Krantz. A, female epistome; B, female ventral gnathosoma; C, male spermatodactyl; D, female projections on leg II. Scale bar for A and B = 50 µm ; C and D = 100 µm

acicular-liked, moderate length. Ventrianal shield oval-shaped with four pairs of acicular setae, nine to ten bipectinated setae on ventral integument (Fig. 1B). Thumb and hook-like projections on each segment of leg II, most leg setae pectinated (Fig. 3D). In gnathosoma, four pairs of simple gnathosomal setae and five rows of deutosternal grooves with numerous denticles (Fig. 3B). Tripartited epistome with forked medial projection (Fig. 3A). Fixed digit of chelicera with simple pillus dentilis, movable digit of chelicera bidentate, dagger-shaped cheliceral seta, tassel-like arthropodial brush present (Fig. 1C). Surface of all shields covered with punctured thick ridges (Figs. 2A, B).

Male. Body size 438 µm in length, 373 µm in width. In ventral, holoventral shield covered whole ventral portion, surface of shield covered with same reticulations as in female (Figs. 2C, D). Genital orifice located on anterior margin of shield, seven pairs of simple setae bearing on shield excluding para and post anal setae (Fig. 1D). Spermatodactyl curved backward (sickle-shaped) (73-77 µm) (Fig. 3C). In legs, most setae acicular-shaped except for some dorsum setae and femur-tibia II with projections. Other morphological features the same as in females.

Specimens examined. 12 ♀♀, 1 ♂, Hangye-ri 854, Bukmyeon, Inje-gun, Gangwon-do, Korea, 24. viii. 2020, from humid leaf litter, leg. Jaeseok Oh.

Distributions. Yap island (Micronesia) (Krantz, 1967); Australia (Halliday, 1988); Philippines (Takaku et al., 2012); Korea.

Remarks. Halliday (1988) described that all of the male's legs setae are smooth and pointed. However, we observed some slightly modified setae in our male specimen. **femur I:** *pd1*, *pd2*; **trochanter II:** *ad*; **femur II:** *ad1*, *ad2*, *pd1*, *pd2*, and *pv1* (blunted); **genu II:** *ad1*, *ad2*, *pd1*, and *pd2*; **tibia II:** *ad1*, *ad2*, *pd1*, and *pd2*; **genu III:** *ad1*, *ad2*, *pd1*, and *pd2*; **tibia III:** *ad*, *pd1*, and *pd2*; **tarsus III:** *ad3*, *ad4*, *pd3*, and *pd4*; **trochanter IV:** *ad*; **femur IV:** *al*, *ad1*, and *pd*; **genu IV:** *al*, *ad1*, *ad2*, *pd1*, and *pd2*; **tibia IV:** *al*, *ad1*, *ad2*, *pd*, and *pl*; **tarsus IV:** *ad3*, *ad4*, *pd3*, and *pd4*.

Key to species of the genus *Holostaspella* in Korea based on the female

1. Anterior margin of dorsal shield with apical projection and setae *jl* 2
- Anterior margin of dorsal shield without apical projection *H. crenulata*
2. Dorsal setae bipectinated except simple setae on medial region; sternal setae *st1-st3* short and smooth; ventrianal shield rectangular-shaped, longer than wide *H. scatophila*
- Dorsal setae slightly pectinated; sternal setae *st1* plumose, *st2* and *st3* simple; ventrianal shield expanded oval-shaped *H. ornata*

Family Blattisociidae Garman, 1948

Genus *Lasioseius* Berlese, 1916

Lasioseius Berlese 1916: 33.

Aceoseius Sellnick, 1941: 149.

Borinquolaelaps Fox, 1946: 450.

Hyattella Krantz, 1962b: 6.

Gnorimus Chaudhri, 1975: 100

Indiraseius Daneshvar, 1987: 32.
Neolaspina Halliday, 1995: 213.

***Lasioseius floridensis* Berlese, 1916** 가슴선화살응애(신칭)
 (Figs. 4-5)

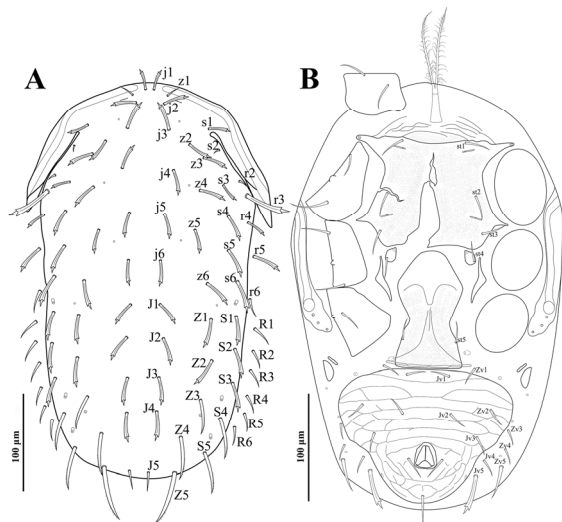


Fig. 4. line drawing of *Lasioseius floridensis* Berlese, female. A, dorsal view; B, ventral view. Scale bar for A and B = 100 μm

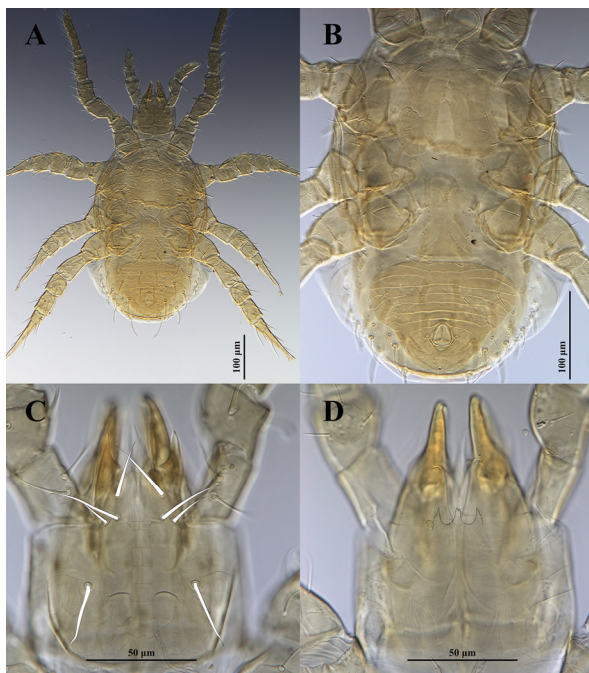


Fig. 5. micro-photographs with a line drawing of *Lasioseius floridensis* Berlese, female. A, dorsal view; B, ventral view; C, ventral gnathosoma; D, epistome. Scale bar for A and B = 100 μm; C and D = 50 μm

Lasioseius (Zercoseius) penicilliger var. *floridensis* Berlese 1916: 44.

Lasioseius arboreus Chant, 1963: 291.

Lasioseius fimetorum Karg, 1971: 248.

Diagnosis. Female. Body pale-yellow colored, rectangular shape, 407 μm in length, 220 μm in width. Dorsal shield not covered whole dorsum, surface of the shield covered with scale-like reticulation. Dorsal shield bearing 36 pairs of tricarinate and pointed-pectinated setae except acicular-shaped *z1*, *s2*, *r2*, and *J5*. Marginal setae *r2-r4* bearing on dorsal shield, *r5*, *r6*, and *R1-R6* situated in the lateral cuticle (Figs. 4A, 5A). Surface of sternal and genital shield covered with dotted patterns, anteromedial part of sternal shield with irregular crack. Ventrianal shield with four pairs of simple setae, surface of shield covered with distinctive lineate reticulations (Figs. 4B, 5B). In gnathosoma, seven rows of deutosternal grooves with numerous denticles (Fig. 5C). Branched epistome with a pair of serrated lateral branches and slightly forked median projection (Fig. 5D).

Specimens examined. 1 ♀, Songcheon-dong, Andong-si, Gyeongsangbuk-do, Korea, 03. vii. 2019, from dried sawdust bedding in *Dorcus rectus* rearing cage, leg. Jaeseok Oh & Sehyeon Bang.

Distribution. Brazil, Canada, Germany, Mexico, and the U.S.A. (Britto et al., 2011); Korea.

Remarks. Christian and Karg (2006) listed *L. floridensis* as one of the species under inquiry within the genus *Lasioseius*. Subsequently, Britto et al. (2011) reestablished *L. floridensis* as a valid species, providing a detailed description and several plates illustrating both sexes.

Key to species of the genus *Lasioseius* in Korea based on the female

1. Dorsal shield with more than 30 pairs of setae 2
- Dorsal shield with less than 30 pairs of setae; ventrianal shield with six pairs of setae *L. youcefi*
2. Dorsal shield with 31 pairs of setae (16 pairs on podonotal

region)	<i>L. porulosus</i>
- Dorsal shield with 35 or 36 pairs of setae (20-21 pairs on podonotal region)	3
3. Dorsal shield with 35 pairs of setae (20 pairs on podonotal)	<i>L. tomokoae</i>
- Dorsal shield with 36 pairs of setae (21 pairs on podonotal)	4
4. Ventrianal shield with six pairs of setae; sternal shield with dotted reticulation	<i>L. furcisetus</i>
- Ventrianal shield with four pairs of setae; sternal shield without dotted reticulation	5
5. Ventral integument with five pairs of setae; sternal shield without irregular crack	<i>L. sugawarai</i>
- Ventral integument with six pairs of setae; sternal shield with irregular crack on Anteromedial part ..	<i>L. floridensis</i>

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Statements for Authorship Position & Contribution

Oh, J.: Seoul National University, Student in Ph.D.; Wrote the manuscript, collecting samples, identification, drawing plates

Lee, S.: Seoul National University, Professor; Designed the research, critically revised the manuscript

All authors read and approved the manuscript.

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