

# Taxonomic Review of the Subfamily Typhlodrominae (Acari: Phytoseiidae) with Generic Recombinations and One Newly Recorded Species in Korea

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## 한국산 바늘이리응애아과의 속 검색표 및 한국미기록 1종의 기재

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**ABSTRACT:** This study presents the list and key to the 8 species of the Subfamily Typhlodrominae from Korea including a newly recorded species, *Typhlodromus coryli* Wu and Lan, 1991. This subfamily comprises four genera: *Kuzinellus* Wainstein, *Paraseiulus* Muma, *Galendromus* Muma, and *Typhlodromus* Scheuten.

**Key words:** Key, List, Typhlodrominae, Phytoseiidae, New record, Korea

**초 록:** 본 연구는 한국산 바늘이리응애아과 (Typhlodrominae)에 대한 종과 속의 검색표와 각 종에 대한 목록을 작성하였다. *Typhlodromus coryli* Wu and Lan, 1991 (생강이리응애)는 한국에서 처음으로 보고된다. 바늘이리응애아과에는 바늘이리응애속 (*Kuzinellus* Wainstein), 느릅이리응애속 (*Paraseiulus* Muma), 서양이리응애속 (*Galendromus* Muma), 그리고 대중이리응애속 (*Typhlodromus* Scheuten) 등 4 속이 있다.

**검색어:** 검색표, 목록, 바늘이리응애아과, 이리응애과, 미기록종, 한국

Many species of the subfamily Typhlodrominae are predaceous mites which occur on a wide range of plants in association with phytophagous mites and insect pest. This study revised the key and the list on eight species of the subfamily Typhlodrominae from Korea. Until now, the key characters of the genera in the subfamily Typhlodrominae have been well known as the number and position of the dorsal setae. Therefore, the subfamily Typhlodrominae previously referred to one genus, *Typhlodromus* in Korea (Ryu and Lee, 1992; Ryu, 1993; Ryu and Ehara, 1990, 1992). However, the nominal species in the

Phytoseiidae has increased in number exponentially to more than 2,280 in the world today (Chant and McMurtry, 2007), so the current classification of the family was taken more genera by other characters, not only dorsal chaetotaxy but also the setation and the nature of the posterior margin of the sternal shield, the shape and setation of the ventrianal shield, setation of legs I-IV and the relative lengths of the setae Z4 and Z5 (Beard, 2001; Chant and McMurtry, 2007). Thus, Korean Typhlodrominae is included in the four genera; *Kuzinellus* Wainstein, *Paraseiulus* Muma, *Galendromus* Muma, *Typhlodromus* Scheuten. The setal nomenclature was based on that of Rowell *et al.* (1978). All measurements are given in micrometers. Length of dorsal shield is the distance between seta j1 and J5, and width is the distance between bases of the seta s4.

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## Taxonomic accounts

### Subfamily Typhlodrominae Wainstein, Chant and McMurtry, 1994 바늘이리응애아과(신칭)

The subfamily Typhlodrominae is characterized by either or both of setae z3 and s6 present on the proscutum and at least one of setae Z1, S2, S4 and S5 present on the postscutum (Chant and McMurtry, 2007).

### Key to the genera of the Korean Typhlodrominae (Adult female)

1. Seta z6 present ..... 2
- Seta z6 absent ..... 3
2. 4 pairs of preanal setae on ventrianal shield  
..... *Kuzinellus*
- 2 pairs of preanal setae on ventrianal shield  
..... *Paraseiulus*
3. Setae S4 and R1 absent ..... *Galendromus*
- Setae S4 and R1 present ..... *Typhlodromus*

Genus *Kuzinellus* Wainstein, 1976 바늘이리응애속(신칭)  
*Kuzinellus* Wainstein, 1976, p. 699; Chant and McMurtry, 2007, p. 143. (Type species: *Paraseiulus kuzini* Wainstein, 1962, p. 139)

The genus *Kuzinellus* is characterized by 19 pairs (j1, j3, j4, j5, j6, J2, J5, z2, z3, z4, z5, z6, Z4, Z5, s4, s6, S2, S4 and S5) of setae on the dorsal shield of an adult female and setae Z1 and Z3 absent; setae r3 and R1 on the interscutal membrane. The adult females have the ventrianal shield with 4 pairs of preanal setae and a pair of pores.

#### 1. *Kuzinellus yokogawae* (Ehara and Hamaoka, 1980) 바늘이리응애

*Typhlodromus* (*Paraseiulus*) *yokogawae* Ehara and Hamaoka, 1980, p. 3-5, figs. 1-7; Ryu and Lee, 1992, p. 35-36, figs. 59-68; Ryu, 1993, p. 113-114, figs. 101-110.

*Kuzinellus yokogawae*: Ehara and Amano, 1998, p. 55, figs. 14, 65; Chant and McMurtry, 2007, p. 144.

**Distribution:** Korea, Japan.

#### Genus *Paraseiulus* Muma, 1961 느릅이리응애속(신칭)

*Paraseiulus* Muma, 1961, p. 299; Chant and McMurtry, 2007, p. 141. (Type species: *Seiulus soleiger* Ribaga, 1904, p. 176)

The genus *Paraseiulus* is characterized by 19 pairs (j1, j3, j4, j5, j6, J2, J5, z2, z3, z4, z5, z6, Z4, Z5, s4, s6, S2, S4 and S5) of setae on the dorsal shield of an adult female and setae Z1 and Z3 absent; setae r3 and R1 on the interscutal membrane. The adults of this genus are also characterized by the absence of caudoventral seta JV2, present on the females of all other species in the subfamily Typhlodrominae. The adult females have the ventrianal shield sole-shaped, with only 2 pairs of preanal setae; the sternal shield with only 2 pairs of setae, with seta ST3 as well as ST4 inserted on separate platelets.

2. *Paraseiulus deogyuensis* (Ryu and Ehara, 1990) 느릅이리응애  
*Typhlodromus* (*Paraseiulus*) *deogyuensis* Ryu and Ehara, 1990, p. 145-150, figs. 1-9; Ryu, 1993, p. 114-116, figs. 111-120.

*Paraseiulus deogyuensis*: Chant and McMurtry, 2007, p. 143.

**Distribution:** Korea.

#### Genus *Galendromus* Muma, 1961 서양이리응애속(신칭)

*Galendromus* Muma, 1961, p. 286; Chant and McMurtry, 2007, p. 164. (Type species: *Typhlodromus floridanus* Muma, 1955, p. 269)

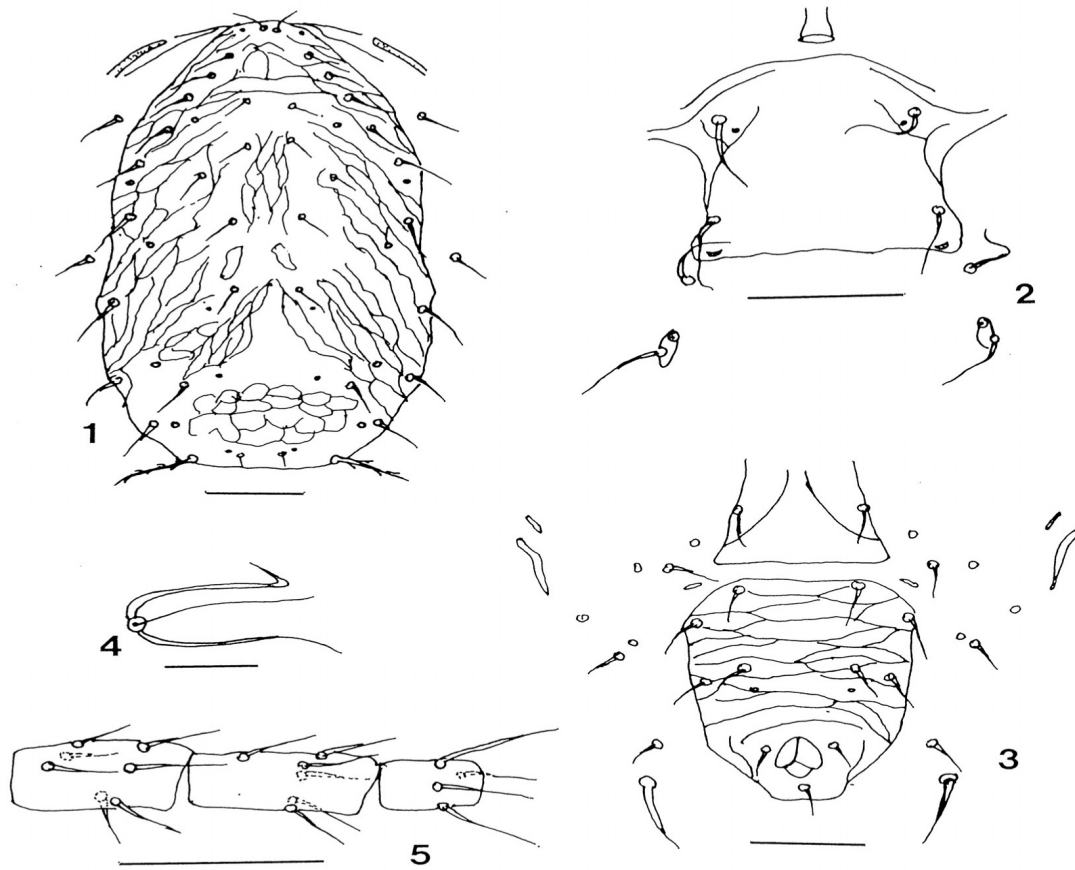
The genus *Galendromus* is characterized by 17 pairs (j1, j3, j4, j5, j6, J2, J5, z2, z3, z4, z5, Z4, Z5, s4, s6, S2 and S5) of setae on the dorsal shield of an adult female and setae Z1 and Z3 absent.; seta r3 on the interscutal membrane and seta R1 absent. The adults of this genus are also characterized by 6 or 7 preanal setae on the ventrianal shield; the sternal shield with only 2 pairs of setae, with seta ST3 as well as ST4 inserted on separate platelets.

3. *Galendromus occidentalis* (Nesbitt, 1951) 서양이리응애  
*Typhlodromus* (*Typhlodromus*) *occidentalis* Nesbitt, 1951, p. 29-30; Collyer, 1982, p. 188, fig. 4; Chant and Yoshida-Shaul, 1984, p. 1868-1870, figs. 23-26.

*Typhlodromus* (*Typhlodromus*) *occidentalis*: Chant, 1959, p. 59, figs. 46-65.

*Galendromus* (*Galendromus*) *occidentalis*: Denmark, 1982, p. 143-145, figs. 37-43.

*Metaseiulus occidentalis*: Schuster and Pritchard, 1963, p.



**Figs. 1-5.** *Typhlodromus coryli* (♀). 1. Dorsum of idiosoma; 2. Sternal shield; 3. Posterior of ventral surface; 4. Spermatheca; 5. Genu, tibia and basitarsus of leg IV. (Scales: 1, 2, 3, 5 = 50  $\mu$ m; 4 = 10  $\mu$ m).

214-217, fig. 14.

*Typhlodromus* (*Galendromus*) *occidentalis*: Ryu and Lee, 1992, p. 36-38, figs. 69-77; Ryu, 1993, p. 123-124, figs. 164-172.

*Galendromus occidentalis*: Chant and McMurtry, 2007, p. 167.

**Distribution:** Korea, Canada, Israel, New Zealand, Russia, South Africa, Taiwan, U.S.A.

**Genus *Typhlodromus* Scheuten, 1857 대중이리응애속**

*Typhlodromus* Scheuten, 1857, p. 111; Chant and McMurtry, 2007, p. 147. (Type species: *Typhlodromus pyri* Scheuten, 1857, p. 111)

This genus contains the largest assemblage of species in the Typhlodrominae. The genus *Typhlodromus* is characterized by 18 pairs (j1, j3, j4, j5, j6, J2, J5, z2, z3, z4, z5, Z4, Z5, s4, s6, S2, S4 and S5) of setae on the dorsal shield of an adult female and setae

Z1 and Z3 absent; setae r3 and R1 on the interscutal membrane. The adult females have the ventrianal shield 3 or 4 pairs of preanal setae; the sternal shield with 3 pairs of setae.

**Key to the Species of the Genus *Typhlodromus* in Korea (Adult female)**

- 1. 3 pairs of preanal setae on ventrianal shield ..... *wonkooi*
- 4 pairs of preanal setae on ventrianal shield ..... 2
- 2. 2 pairs of setae on sternal shield ..... 3
- 3 pairs of setae on sternal shield ..... 4
- 3. Seta Z5 longer than twice the length of s4 ..... *yasumatsui*
- Seta Z5 shorter than twice the length of s4 ..... *coryli*
- 4. Macroseta on genu IV shorter than that on tibia IV ..... *serrulatus*

- Macroseta on genu IV longer than that on tibia IV  
..... *vulgaris*

**4. *Typhlodromus wonkooi* Ryu and Ehara, 1992 짧은털이리응애**  
*Typhlodromus wonkooi* Ryu and Ehara, 1992, p. 723-725, figs. 1-6; Chant and McMurtry, 2007, p. 157.

*Typhlodromus (Anthoseius) wonkooi* Ryu, 1993, p. 116-117, figs. 121-126.

**Distribution:** Korea.

**5. *Typhlodromus yasumatsui* Ehara, 1966 임금이리응애**  
*Typhlodromus (Anthoseius) yasumatsui* Ehara, 1966, p. 11-12, figs. 7-14, Ehara, 1975, p. 26, 31, fig. 12; Ehara, 1977, p. 31; Ryu and Lee, 1992, p. 32-35, figs. 50-58; Ryu 1993, p. 117-118, figs. 123-135.

*Typhlodromus yasumatsui*: Chant and McMurtry, 2007, p. 157.

**Distribution:** Korea, Japan.

**6. *Typhlodromus coryli* Wu and Lan, 1991 생강이리응애(신칭)  
(Figs. 1-5)**

*Typhlodromus (Anthoseius) coryli* Wu and Lan, 1991, p. 329-330, figs. 5-8.

*Typhlodromus coryli*: Chant and McMurtry, 2007, p. 152.

**Female:** Dorsal shield reticulate; 286 long, 139 wide; with 18 pairs of setae and at least 5 pairs of pores. Setae on dorsal shield: Z5 the longest, sparsely barbed; the remaining setae shorter, smooth; S2 about as long as s6 and longer than Z4 and S4. Setae r3 and R1 on interscutal membrane, smooth. Peritreme extending to level of j3. Sternal shield with 2 pairs of setae, ST1 and ST2, third pair, ST3, on membrane; metasternal platelets much longer than width. Ventrianal shield much longer than wide, with lateral margins straight or slightly concave, wider than genital shield; 4 pairs of preanal setae; a pair of very small pores nearly posterior to seta JV2. Seta JV5 smooth. 2 pairs of slender metapodal platelets, the posterior pair much longer. Spermatheca with U-shaped. Dentition of chelicera not observable because of angle. Chaetotaxic formula: genu II 2-2/0, 2/0-1; genu III 1-2/1, 2/0-1. Basitarsus IV with a weak macroseta. Lengths of setae (n = 3, mean): j1 16.8, j3 24.8, j4 14.1, j5 13.6, j6 16.2, J2 16.2, J5 8.5, z2 18.1, z3 23.4, z4 24.0, z5 15.4, Z4 23.7, Z5 40.8, s4 25.8, s6 28.5, S2 29.8, S4 24.8, S5

25.3, r3 20.5, R1 21.8, JV5 30.6, macrosetae on basitarsus IV 26.9.

**Male:** Not known.

**Distribution:** Korea, China.

**Material examined:** 2 ♀ ♀, Mujugucheondong Muju-gun, Jeollabuk-do, 4.vii. 1990, on *Lindera obtusiloba* Bl.; 1 ♀, Mujugucheondong Muju-gun, Jeollabuk-do, 4.vii. 1990, on *Styrax obassia* S. et Z.; 1 ♀, Mujugucheondong Muju-gun, Jeollabuk-do, 30.vii. 1990. on *Lindera obtusiloba* Bl.; 2 ♀ ♀, Mount Jeombong-san, Inje-gun, Gangweon-do, 2.viii, 1994, on *Acer pseudo-sieboldianum* (Pavton) Kom.

**Remarks:** *Typhlodromus coryli* was known previously from China. Basitarsus IV with a weak macroseta.

**7. *Typhlodromus serrulatus* Ehara, 1972 톱니이리응애**

*Typhlodromus (Anthoseius) serrulatus* Ehara, 1972, p. 142-143, figs. 19-24; Ehara, 1975, p. 25, 32, fig. 14; Ehara, 1977, p. 31; Ryu and Lee, 1992, p. 31-33, figs. 40-49; Ryu, 1993, p. 117-120, figs. 136-145.

*Typhlodromus serrulatus*: Chant and McMurtry, 2007, p. 155.

**Distribution:** Korea, China, Japan.

**8. *Typhlodromus vulgaris* Ehara, 1959 대중이리응애**

*Typhlodromus vulgaris* Ehara, 1959, p. 286-288, figs. 1-5; Ehara, 1961, p. 95-96, figs. 1-2; Lee, 1961, p. 64; Chant and McMurtry, 2007, p. 157.

*Typhlodromus (Anthoseius) vulgaris* Ehara, 1977, p. 31; Ryu and Ehara, 1990, p. 147; Ryu, 1993, p. 120-121, figs. 146-154.

*Typhlodromus (Anthoseius) chinensis* (nec Ehara and Lee, 1971): Ryu and Lee 1992, p. 30, figs. 31-39.

**Distribution:** Korea, China, Japan, Russia.

**Remarks:** Previously, the specimens that were collected at Mujugucheondong, Muju-gun, Jeollabuk-do were recorded as *Typhlodromus chinensis* (Ryu and Lee, 1992). But, that is the same species as *T. vulgaris*. *T. vulgaris* is geographically variable in the setal length on the dorsal shield. Therefore, *T. chinensis* has not occurred in Korea.

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