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Title	Phytoseiid Mites from Hokkaido (Acarina: Mesostigmata) (With 71 Text-figures)
Author(s)	EHARA, Shōzō
Citation	北海道大學理學部紀要, 16(2), 212-233
Issue Date	1967-12
Doc URL	https://hdl.handle.net/2115/27444
Type	departmental bulletin paper
File Information	16(2)_P212-233.pdf



Phytoseiid Mites from Hokkaido (Acarina: Mesostigmata)¹⁾

By

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(With 71 Text-figures)

Seven mite species belonging to the family Phytoseiidae were recorded from Hokkaido prior to this study. In the present paper descriptions and records are given of the following twelve phytoseiid species, ten of which are new to science:

1. *Typhlodromus (Anthoseius) borealis* n. sp.²⁾ (p. 213)
2. *Amblyseius (Amblyseius) haimatus* n. sp. (p. 214)
3. *Amblyseius (Amblyseius) paraki* n. sp. (p. 216)
4. *Amblyseius (Amblyseius) ainu* n. sp. (p. 218)
5. *Amblyseius (Amblyseius) morii* n. sp. (p. 219)
6. *Amblyseius (Amblyseius) tsugawai* Ehara (p. 221)
7. *Amblyseius (Amblyseius) firmus* n. sp. (p. 222)
8. *Amblyseius (Amblyseius) ezoensis* n. sp. (p. 223)
9. *Amblyseius (Kampimodromus) maritimus* n. sp. (p. 224)
10. *Phytoseius (Phytoseius) nipponicus* Ehara (p. 227)
11. *Phytoseius (Phytoseius) kishii* n. sp. (p. 228)
12. *Phytoseius (Phytoseius) campestris* n. sp. (p. 229)

A key to the species of phytoseiids found in Hokkaido is added in final pages of this paper. The type specimens of the new species described here are retained in the Zoological Institute, Faculty of Science, Hokkaido University.

The major part of the materials on which this paper is based were collected by staff and students of the Department of Applied Zoology, Faculty of Agriculture, Hokkaido

1) Contribution No. 785 from the Zoological Institute, Faculty of Science, Hokkaido University, Sapporo, Japan.

2) Since *Neoseiulus* Hughes, 1948, is a synonym of *Amblyseius* Berlese, 1915, the names of the four Japanese species so far referred to the subgenus *Neoseiulus* are changed (cf. Ehara, 1967, p. 69):

Typhlodromus (Anthoseius) bambusae Ehara
Typhlodromus (Anthoseius) insularis Ehara
Typhlodromus (Anthoseius) vulgaris Ehara
Typhlodromus (Anthoseius) yasumatsui Ehara

Jour. Fac. Sci. Hokkaido Univ. Ser. VI, Zool. 16, 1967.

University, in Sapporo and its vicinity, Hidaka, and Sarobetsu. Other part of the materials were taken by members of the Zoological Institute, Faculty of Science, Hokkaido University, in Prov. Abashiri and at Mt. Muine. The writer is indebted to Dr. H. Mori and Mr. N. Kishi of the Department of Applied Zoology, and to Messrs. H. Fukuda, T. Matsumura, H. Tamura, and K. Yamauchi of the Zoological Institute, for their kindness in placing these materials at the writer's disposal. The writer is also very grateful to Dr. A.M. Hughes, Royal Free Hospital School of Medicine, London, for the loan of specimens of *Amblyseius (A.) bakeri*, to Dr. W. Karg, Biologische Zentralanstalt Berlin, Kleinmachnow, for the loan of specimens of *A. (A.) reticulatus*, and to Dr. M. H. Muma, University of Florida, Lake Alfred, for the loan of a specimen of *A. (A.) bakeri*. Finally, his thanks are due to Prof. M. Yamada and Dr. Sh. F. Sakagami, Zoological Institute, Hokkaido University, who kindly made profitable suggestions.

1. *Typhlodromus (Anthoseius) borealis* n. sp.

(Jap. name: Kitami-kaburidani)

(Figs. 1-7)

Female. Dorsal shield strongly sculptured; six pairs of dorsocentral setae; a small but distinct pore between setae D_2 and L_4 . Setae on dorsal shield: L_{10} stout, serrate, weakly capitate; remaining setae much smaller, practically nude. Setae S_1 and S_2 on interscutal membrane. Peritreme extending forward to seta D_1 . Sternal shield with two pairs of setae; third pair of sternal setae set on weakly sclerotized platelets; metasternal platelets as illustrated. Ventrianal shield approximately pentagonal, longer than wide, wider than genital shield, with four pairs of preanal setae; a pair of minute pores in a transverse line with the posteriormost preanal pair. Four pairs of setae on membrane surrounding ventrianal shield. Two pairs of slender metapodal platelets, the anterior pair very slender. Spermatheca as figured. Leg IV with three capitate macrosetae, those on genu and tibia similar in length to other setae on these segments. Measurements in microns: idiosoma length 430, idiosoma width 280; lengths of setae: L_1 18, L_2 16, L_3 19, L_4 18, L_5 21, L_6 23, L_7 23, L_8 26, L_9 24, L_{10} 38, M_1 17, M_2 26, D_1 19, D_2 15, D_3 16, D_4 18, D_5 20, D_6 11, S_1 19, S_2 18, VL_1 31, macrosetae of leg IV: genu 19, tibia 21, basitarsus 30.

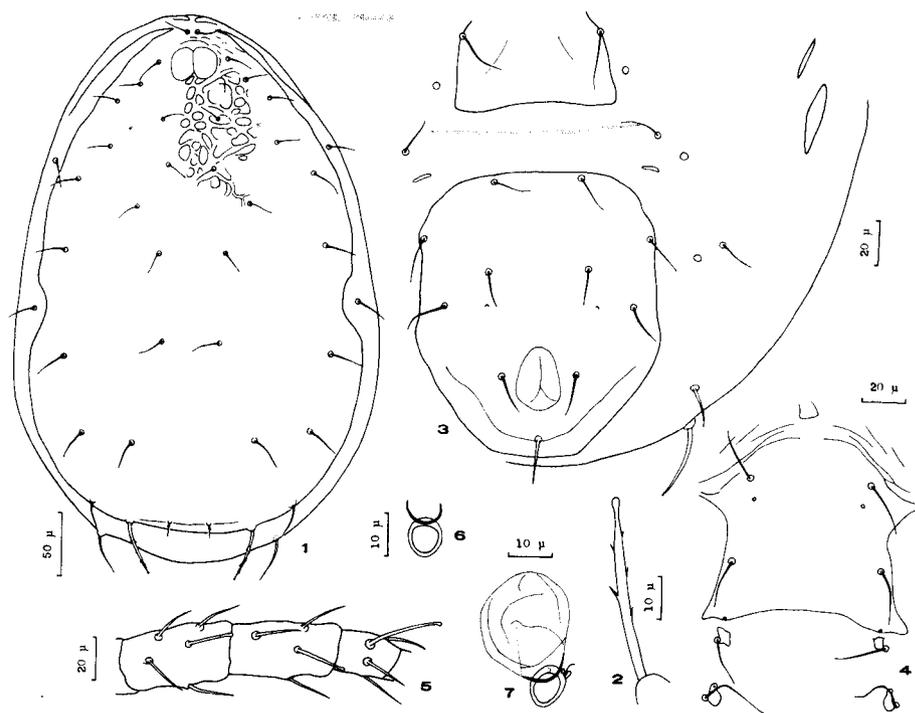
Male. Not known.

Type. Holotype: ♀, Hamakoshimizu, Prov. Abashiri, 21-VI-1966 (T. Matsumura leg.), on gall of *Rosa rugosa* Thunb., produced by a cynipid wasp *Liebelia (Nipporhodites) fukudae* Shinji.¹⁾

Remarks. *Typhlodromus (Anthoseius) borealis* n. sp. closely resembles *T. (A.) bakeri* (Garman, 1948), but differs from it in the spermatheca and chaetotaxy of leg IV. Genu IV, tibia IV, and basitarsus IV each has one capitate macroseta and pointed setae in *borealis*, while each of them has capitate, subcapitate and pointed setae in addition to one capitate macroseta in *bakeri*. (The writer has examined a female specimen of *bakeri* borrowed from Dr. M. H. Muma.) This new species is

1) Identified by Dr. Sh. F. Sakagami.

also similar to *T. (A.) recki* Wainstein, 1958, and *T. (A.) nodosus* De Leon, 1962, but is distinguished from them by the shape of the spermatheca.



Figs. 1-7. *Typhlodromus (Anthoseius) borealis* n. sp. 1, dorsum of idiosoma (♀). 2, seta L_{10} (♀). 3, posterior ventral surface (♀). 4, sternal shield (♀). 5, genu, tibia and basitarsus of leg IV (♀). 6, 7, spermatheca.

2. *Amblyseius (Amblyseius) haimatus* n. sp.

(Jap. name: Miyama-kaburidani)

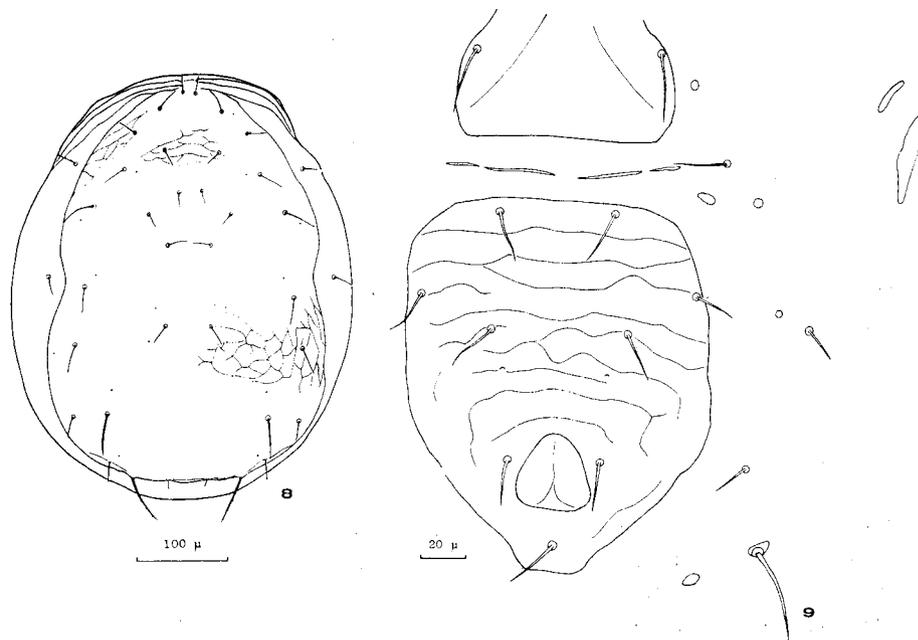
(Figs. 8-12)

Female. Body heavily sclerotized. Dorsal shield reticulate, with at least eight pairs of pores; six pairs of dorsocentral setae. Setae on dorsal shield: L_9 and M_2 stout, very weakly serrate; M_2 longer than distance between its base and that of L_7 , reaching a pore near L_8 ; remaining setae small to minute, L_7 shorter than distance its base to that of M_2 . Seta S_1 on interscutal membrane or on dorsal shield, seta S_2 on interscutal membrane. Peritreme extending forward to seta D_1 . Sternal shield with three pairs of setae; metasternal platelets as figured. Ventrianal shield longer than wide, wider than genital shield, with three pairs of preanal setae; a pair

of pores between and behind the posterior pair of preanals. Four pairs of setae on membrane surrounding ventrianal shield. Two pairs of slender metapodal platelets, the posterior pair very long. Spermatheca as illustrated. Leg IV with three pointed macrosetae. Measurements in microns: idiosoma length 460, idiosoma width 350; lengths of setae: L_1 27, L_2 20, L_3 27, L_4 35, L_5 29, L_6 30, L_7 25, L_8 23, L_9 52, M_1 14, M_2 42, D_1 22, D_2 19, D_3 16, D_4 21, D_5 24, D_6 10, S_1 21, S_2 21, VL_1 35, macrosetae of leg IV: genu 35, tibia 39, basitarsus 53.

Male. Not known.

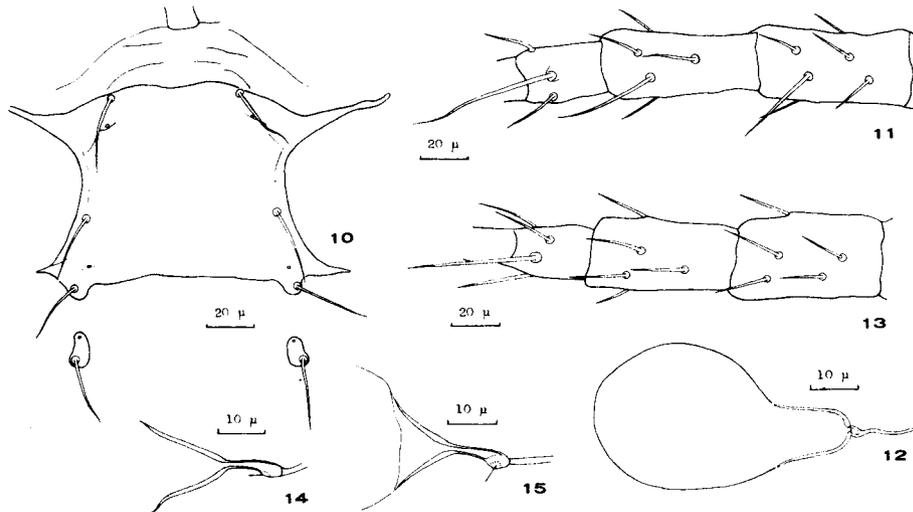
Types. Holotype: ♀, Mt. Muine, 28-VI-1966 (H. Fukuda leg.), on *Pinus pumila* Rgl. Paratypes: 3 ♀♀, data same as for holotype.



Figs. 8-9. *Amblyseius (Amblyseius) haimatus* n. sp. 8, dorsum of idiosoma (♀). 9, posterior ventral surface (♀).

Remarks. This new species closely resembles *Amblyseius (A.) reticulatus* (Oudemans, 1930b) and *A. (A.) barkeri* (Hughes, 1948) in dorsal chaetotaxy, but it differs from them in the number of the macrosetae of leg IV and in the shape of the spermatheca. The writer has examined a female and a male German specimens of *reticulatus* borrowed from Dr. W. Karg, and a female and a male English specimens of *barkeri* borrowed from Dr. A. M. Hughes. Illustrations of leg IV and spermatheca of *reticulatus* are shown in Figs. 13-15 (See also Fig. 33 in Karg, 1962). *A. barkeri*

appears to have no macrosetae on genu IV and tibia IV, and its spermatheca is very slender.



Figs. 10–12. *Amblyseius (Amblyseius) hatimatus* n. sp. 10, sternal shield (♀). 11, genu, tibia and basitarsus of leg IV (♀). 12, spermatheca. Figs. 13–15. *Amblyseius (Amblyseius) reticulatus* (Oudemans). 13, genu, tibia and basitarsus of leg IV (♀). 14, 15, spermatheca.

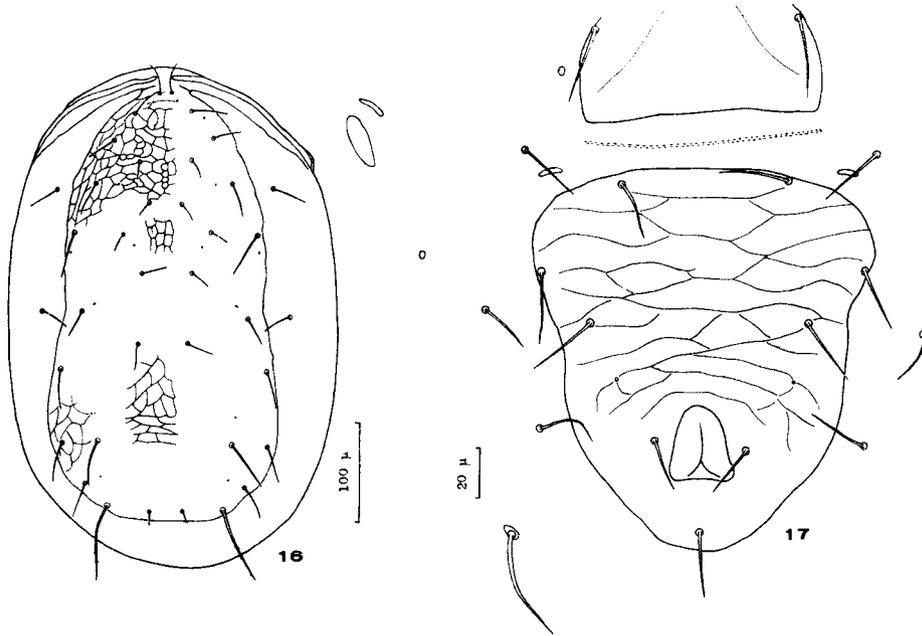
3. *Amblyseius (Amblyseius) paraki* n. sp.¹⁾

(Jap. name: Paraki-kaburidani)

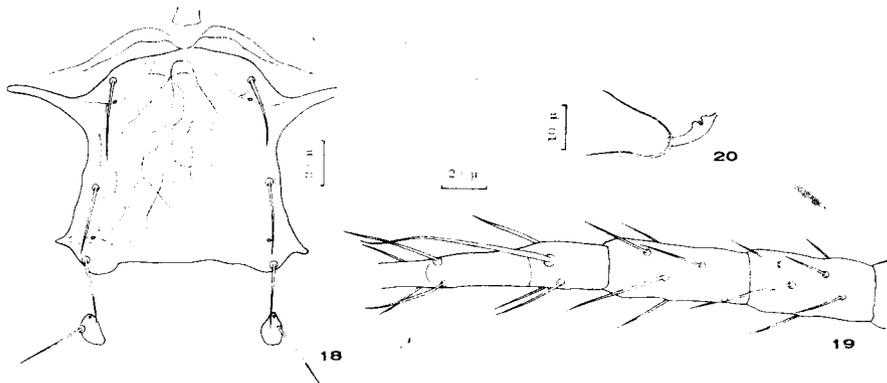
(Figs. 16–20)

Female. Dorsal shield reticulate, with at least eight pairs of pores; six pairs of dorsocentral setae. Setae on dorsal shield: L_4 and M_2 stout, smooth; L_9 the stoutest, very sparsely barbed; other setae smaller, L_7 longer than distance between its base and that of M_2 . Setae S_1 and S_2 on interscutal membrane. Peritreme extending forward to seta D_1 . Sternal shield with three pairs of setae; metasternal platelets oval. Ventrianal shield longer than wide, wider than genital shield, with three pairs of preanal setae; a pair of very minute pores between and behind the third pair of preanals. Four pairs of setae on membrane surrounding ventrianal shield. Two pairs of slender metapodal platelets, the posterior pair broad. Spermatheca as figured. Fixed digit of chelicera with four teeth distally. Leg IV with three pointed macrosetae. Measurements in microns: idiosoma length 470, idiosoma width 310; lengths of setae: L_1 33, L_2 26, L_3 31, L_4 42, L_5 28, L_6 37, L_7 36, L_8 33, L_9 68, M_1 20, M_2 45, D_1 26, D_2 18, D_3 17, D_4 22, D_5 26, D_6 12, S_1 29,

1) "Paraki" is an Ainu noun meaning mite.



Figs. 16-17. *Amblyseius (Amblyseius) paraki* n. s.p 16, dorsum of idiosoma (♀). 17, posterior ventral surface (♀).



Figs. 18-20. *Amblyseius (Amblyseius) paraki* n. sp. 18, sternal shield (♀). 19, genu, tibia and tarsus of leg IV(♀). 20, spermatheca.

S₂ 27, VL₁ 39, macrosetae of leg IV: genu 42, tibia 39, basitarsus 74.

Male. Not known.

Type. Holotype: ♀, Sapporo, 6-VI-1966 (N. Kishi leg.), on apple.

Remarks. *Amblyseius (A.) paraki* n. sp. is similar to *A. (A.) cucumeris* (Oudemans, 1930b), but is different from the latter in having the peritremes much longer (Schuster and González, 1963). Further, this new mite is somewhat similar to *A.(A.) zwölferti* (Dosse, 1957), but is distinctive from it in the relative lengths of the dorsal setae.

4. *Amblyseius (Amblyseius) ainu* n. sp.

(Jap. name: Ainu-kaburidani)

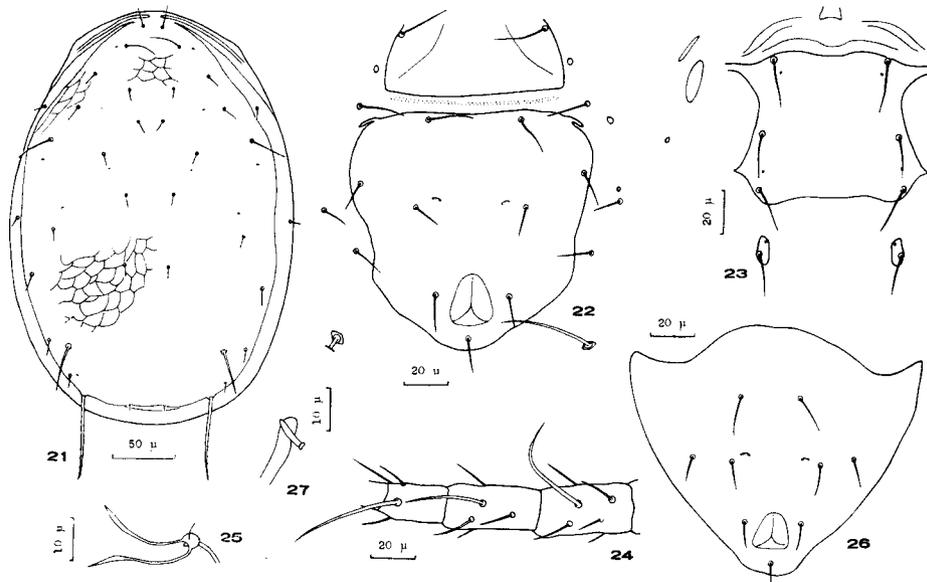
(Figs. 21-27)

Female. Dorsal shield reticulate, with at least seven pairs of pores; six pairs of dorsocentral setae. Setae on dorsal shield: L₉ stout, serrate, much shorter than distance between bases of L₉; M₂ stout, practically nude, approximately one half as long as L₉; L₄ nude, about twice as long as L₃ and L₆; L₁ more or less longer than D₁; remaining setae much shorter, L₆ only slightly longer than L₅. Setae S₁ and S₂ on interscutal membrane. Peritreme extending beyond seta D₁. Sternal shield with three pairs of setae; metasternal platelets slender. Ventrianal shield as long as wide, or slightly longer than wide, wider than genital shield. The elongate platelet near each anterolateral corner of the ventrianal shield is very often fused with the latter. Three pairs of preanal setae on ventrianal shield; a pair of transverse, conspicuous pores between and slightly before the posterior pair of preanals (the pores sometimes in a transverse line with the posterior preanals). Four pairs of setae on membrane surrounding ventrianal shield. Two pairs of metapodal platelets, the anterior pair very slender. Spermatheca as illustrated. Genu IV with a blunt-ended to subcapitate macroseta; tibia IV and basitarsus IV each with a pointed macroseta. Measurements in microns: idiosoma length 330, idiosoma width 230; lengths of setae: L₁ 22, L₂ 11, L₃ 12, L₄ 29, L₅ 10, L₆ 14, L₇ 12, L₈ 9, L₉ 65, M₁ 8, M₂ 35, D₁ 18, D₂ 8, D₃ 9, D₄ 10, D₅ 11, D₆ 6, S₁ 11, S₂ 9, VL₁ 34, macrosetae of leg IV: genu 37, tibia 30, basitarsus 45.

Male. Setae S₁ and S₂ on dorsal shield. Ventrianal shield with three pairs of preanal setae, a pair of pores being slightly anterior to, or in a transverse line with inner pair of posterior preanal setae. Spermatophoral process of chelicera hammer-shaped. Measurements in microns: idiosoma length 250, idiosoma width 150; lengths of setae: L₁ 18, L₃ 7, L₄ 19, L₉ 48, M₂ 19, D₁ 17, macrosetae of leg IV: genu 22, tibia 23, basitarsus 38.

Types. Holotype: ♀, Mombetsu, Prov. Hidaka, 23~24-VII-1966 (N. Kishi leg.), on *Cirsium kamtschaticum* Ledeb. Allotype: ♂, on *Cacalia hastata* L. var. *orientalis* (Kitam.) Ohwi. Paratypes: 4 ♀♀, data same as for holotype; 3 ♀♀, data same as for allotype; 2 ♀♀ & 4 ♂♂, on sasa bamboo, 1 ♀, on *Quercus dentata* Thunb., 1 ♀, on *Vitis coignetiae* Pulliat, 1 ♀, on *Onoclea sensibilis* L., other data same as for holotype.

Remarks. *Amblyseius (A.) ainu* n. sp. is closely allied to *A. (A.) oguroi* Ehara, 1964, and *A. (A.) okinawanus* Ehara, 1967, but is distinguished from these species by having L_4 about twice as long as L_3 and L_6 , and by having L_9 much shorter than distance between bases of L_9 .



Figs. 21–27. *Amblyseius (Amblyseius) ainu* n. sp. 21, dorsum of idiosoma (♀). 22, posterior ventral surface (♀). 23, sternal shield (♀). 24, genu, tibia and basitarsus of leg IV (♀). 25, spermatheca. 26, ventrianal shield (♂). 27, spermatophoral process of ♂ chelicera.

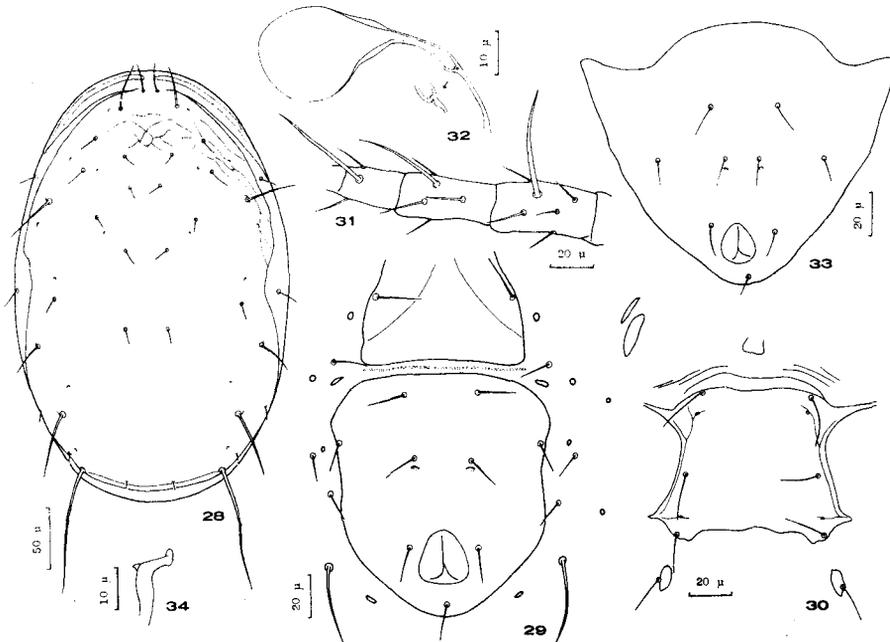
5. *Amblyseius (Amblyseius) morii* n. sp.

(Jap. name: Sarobetsu-kaburidani)

(Figs. 28–34)

Female. Dorsal shield faintly reticulate, with at least eight pairs of pores; six pairs of dorsocentral setae. Setae on dorsal shield practically smooth except for setae M_2 and L_9 which are provided sparsely with minute barbs; L_6 noticeably longer than L_5 ; relative lengths: $L_9 > M_2 > L_4 > L_1 > L_6 > D_1$; $L_3 > L_2$. Setae S_1 and S_2 on interscutal membrane. Peritreme extending forward to seta D_1 . Sternal shield with three pairs of setae; metasternal platelets slender. Ventrianal shield slightly longer than, or about as long as wide, wider than genital shield, with lateral margins slightly concave. Three pairs of preanal setae on ventrianal shield; a pair of conspicuous transverse pores just behind the posterior preanal setae. Four pairs

of setae surrounding ventrianal shield. Two pairs of slender metapodal platelets, the anterior pair much smaller. Spermatheca as illustrated. Chelicera with fixed digit multidentate. Leg IV with three tapering macrosetae, that on genu weakly blunt-ended. Measurements in microns: idiosoma length 350, idiosoma width 230; lengths of setae: L_1 32, L_2 14, L_3 18, L_4 39, L_5 13, L_6 27, L_7 11, L_8 10, L_9 89, M_1 9, M_2 49, D_1 22, D_2 10, D_3 9, D_4 12, D_5 12, D_6 8, S_1 15, S_2 16, VL_1 34, macrosetae of leg IV: genu 39, tibia 35, basitarsus 40.



Figs. 28-34. *Amblyseius (Amblyseius) morii* n. sp. 28, dorsum of idiosoma (♀). 29, posterior ventral surface (♀). 30, sternal shield (♀). 31, genu, tibia and basitarsus of leg IV (♀). 32, spermatheca. 33, ventrianal shield (♂). 34, spermatophoral process of ♂ chelicera.

Male. Setae S_1 and S_2 on dorsal shield. Ventrianal shield with three pairs of preanal setae; a pair of pores just behind the innermost pair of preanals. Spermatophoral process of chelicera hammer-shaped. Measurements in microns: idiosoma length 270, idiosoma width 170; lengths of setae: L_1 26, L_2 10, L_3 15, L_4 32, L_5 12, L_6 20, L_7 9, L_8 8, L_9 59, M_1 9, M_2 36, D_1 19, D_2 9, D_3 9, D_4 10, D_5 10, D_6 5, S_1 14, S_2 13, VL_1 21, macrosetae of leg IV: genu 24, tibia 26, basitarsus 35.

Types. Holotype (♀) and allotype (♂): Toyotomi, Sarobetsu wasteland, 12~14-VII-1966 (H. Mori *et al.* leg.), on *Salix hultenii* Floderus var. *angustifolia* Kitamura. Paratypes: 7 ♀♀ & 2 ♂♂, on *Kalopanax pictus* (Thunb.), 1 ♀ & 1 ♂, on *Rhus ambigua* Lavallée, other data same as for holotype.

Remarks. Among a group of species bearing seta L_6 noticeably longer than L_5 , this new species is distinctive in having the ventrianal pores conspicuous, just behind the posterior pair of preanals. This mite is named in honor of Dr. Hans Mori who have generously furnished many specimens of phytoseiids for this study.

6. *Amblyseius (Amblyseius) tsugawai* Ehara

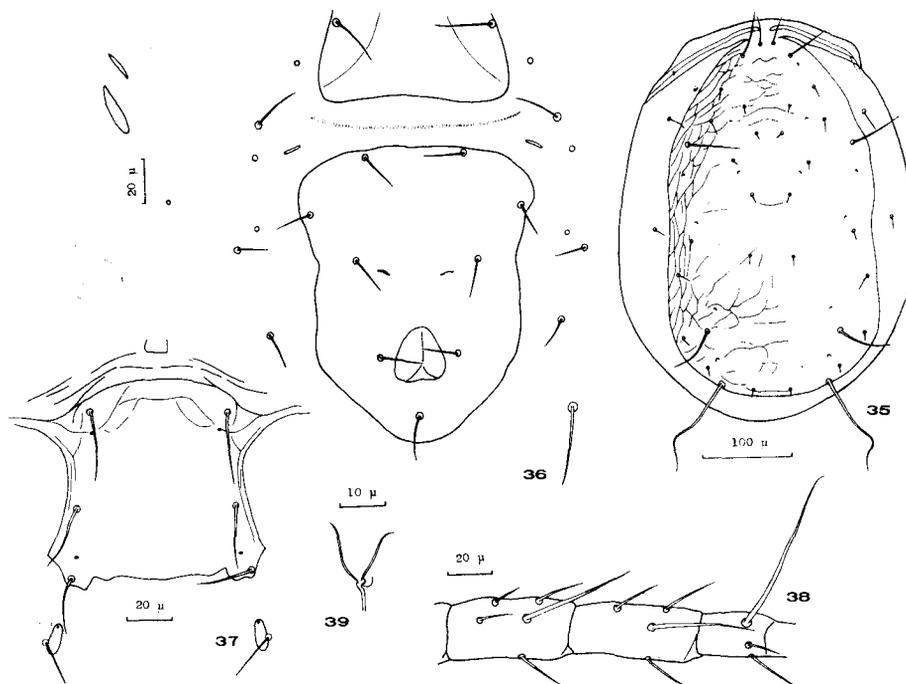
(Figs. 35-39)

Amblyseius tsugawai Ehara, 1959, p. 290, Figs. 12, 13; Ehara, 1964, p. 386, Figs. 24-27.

Typhlodromus (Amblyseius) tsugawai, Chant, 1959, p. 92.

Amblyseius (Amblyseius) tsugawai, Ehara, 1966, p. 23.

This mite was previously known only from Honshu, and it is new to Hokkaido. Measurements for female (in microns): idiosoma length 410, idiosoma width 280; lengths of setae: L_1 35, L_4 49, L_9 116, M_2 50, D_1 26, VI_{1-1} 44, macrosetae of leg IV: genu 45, tibia 42, basitarsus 67. The measurements for the male were given in a previous paper (Ehara, 1964).



Figs. 35-39. *Amblyseius (Amblyseius) tsugawai* Ehara. 35, dorsum of idiosoma (♀). 36, posterior ventral surface (♀). 37, sternal shield (♀). 38, genu, tibia and basitarsus of leg IV (♀). 39, spermatheca.

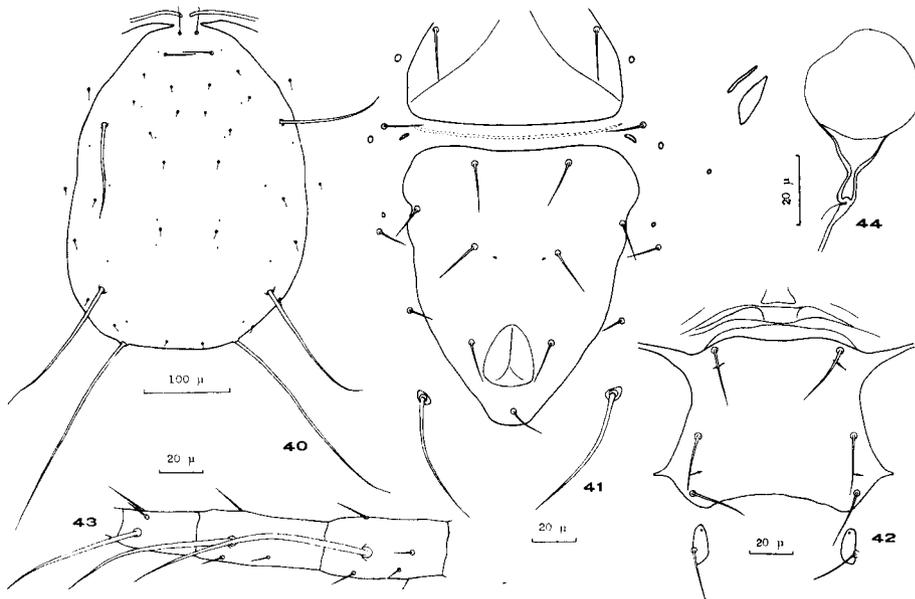
Specimens from Hokkaido. One ♀, Sapporo, 31-VII-1966 (N. Kishi leg.), on *Magnolia kobus* DC. var. *borealis* Sarg.; 2 ♀♀, on *Filipendula kamtschatica* (Pall.) Maxim.; 2 ♀♀ & 2 ♂♂, on *Salix hultenii* Floderus var. *angustifolia* Kimura, 6 ♀♀ & 1 ♂, on *Cirsium kamtschaticum* Ledeb., Toyotomi, Sarobetsu wasteland, 12~14-VII-1966 (H. Mori *et al.* leg.).

7. *Amblyseius (Amblyseius) firmus* n. sp.

(Jap. name: Oni-kaburidani)

(Figs. 40-44)

Female. Body heavily sclerotized. Dorsal shield nearly smooth, with many minute pores which are partly shown in Fig. 40; six pairs of dorsocentral setae. Setae on dorsal shield smooth except for setae L_9 and M_2 which are weakly pectinate; L_4 , L_9 and M_2 very long, whip-like; D_1 and L_1 smaller, subequal in length; remaining setae minute. Setae S_1 and S_2 on interscutal membrane. Peritremes extending between setae D_1 . Sternal shield with three pairs of setae; metasternal platelets slender. Ventrianal shield triangular, longer than wide, slightly wider than genital shield; three pairs of preanal setae; a pair of minute pores between and slightly behind the posterior pair of preanals. Four pairs of setae surround-



Figs. 40-44. *Amblyseius (Amblyseius) firmus* n. sp. 40, dorsum of idiosoma (♀). 41, posterior ventral surface (♀). 42, sternal shield (♀). 43, genu, tibia and basitarsus of leg IV (♀). 44, spermatheca.

ing ventrianal shield. Two pairs of metapodal platelets, the anterior pair very slender, the posterior pair much wider, approximately triangular. Spermatheca with cervix constricted medially. Chelicera with fixed digit multidentate. Leg IV with a whip-like macroseta on genu, tibia and basitarsus. Measurements in microns: idiosoma length 370, idiosoma width 300; lengths of setae: L_1 31, L_2 6, L_3 6, L_4 103, L_5 9, L_6 13, L_7 11, L_8 10, L_9 236, M_1 6, M_2 157, D_1 29, D_2 6, D_3 6, D_4 7, D_5 9, D_6 6, S_1 11, S_2 9, VL_1 58, macrosetae of leg IV: genu 101, tibia 75, basitarsus 63.

Male. Not known.

Types. Holotype: ♀, Mombetsu, Prov. Hidaka, 23~24-VII-1966 (N. Kishi leg.), on *Magnolia kobus* DC. var. *borealis* Sarg. Paratype: 1 ♀, on *Osmunda cinnamomea* L., other data same as for holotype.

Remarks. *Amblyseius (A.) firmus* n. sp. most closely resembles *A. (A.) saurus* De Leon, 1962, but differs from the latter in having the cervix of the spermatheca constricted medially, and in the position and size of the ventrianal pores. This new species is also similar to *A. (A.) krantzi* Chant, 1959, but is easily separable from it by the ventrianal shield, particularly by the position of the posterior preanal setae and of the pores.

8. *Amblyseius (Amblyseius) ezoensis* n. sp.

(Jap. name: Ezo-kaburidani)

(Figs. 45-49)

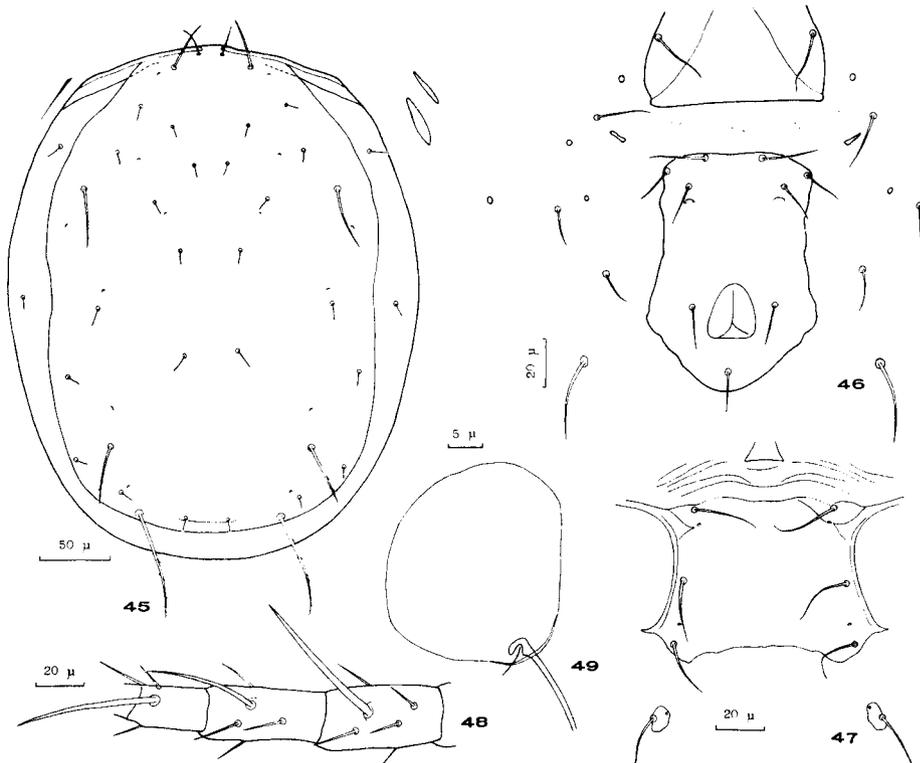
Female. Dorsal shield nearly smooth, with at least seven pairs of pores; six pairs of dorsocentral setae. Setae on dorsal shield: L_9 and M_2 stout, with minute barbs sparsely, L_9 less than twice as long as M_2 ; L_1 and L_4 stout, practically smooth, L_4 about as long as M_2 ; remaining setae short to minute. Setae S_1 and S_2 on interscutal membrane. Peritreme extending to seta D_1 . Sternal shield with three pairs of setae; metasternal platelets as illustrated. Ventrianal shield slender, approximately vase-shaped, widest at level of anus, nearly as wide as genital shield; three pairs of preanal setae and a pair of pores on anterior one-third of preanal region, the pores crescent-shaped, just caudad from the posteriormost preanals. Four pairs of setae on membrane surrounding ventrianal shield. Two pairs of slender metapodal platelets. Spermatheca as figured. Chelicera with fixed digit multidentate. Leg IV with three tapering macrosetae. Measurements in microns: idiosoma length 360, idiosoma width 280; lengths of setae: L_1 30, L_2 10, L_3 9, L_4 40, L_5 13, L_6 10, L_7 9, L_8 9, L_9 72, M_1 10, M_2 40, D_1 20, D_2 9, D_3 9, D_4 10, D_5 14, D_6 8, S_1 12, S_2 9, VL_1 30, macrosetae of leg IV: genu 57, tibia 42, basitarsus 56.

Male. Not known.

Types. Holotype: ♀, Mt. Moiwa, Sapporo, 25-V-1966 (N. Kishi leg.), on *Heracleum dulce* Fisch. Paratype: 1 ♀, data same as for holotype.

Remarks. *Amblyseius (A.) ezoensis* n. sp. resembles *A. (A.) terminalis* Chant and Baker, 1965, and *A. (A.) estradai* Chant and Baker, 1965, both of which are known from Central America. But, this new species is distinguished from these

species by its characteristic ventrianal shield, and by having three macrosetae on leg IV.



Figs. 45-49. *Amblyseius (Amblyseius) ezoensis* n. sp. 45, dorsum of idiosoma (♀). 46, posterior ventral surface (♀). 47, sternal shield (♀). 48, genu, tibia and basitarsus of leg IV (♀). 49, spermatheca.

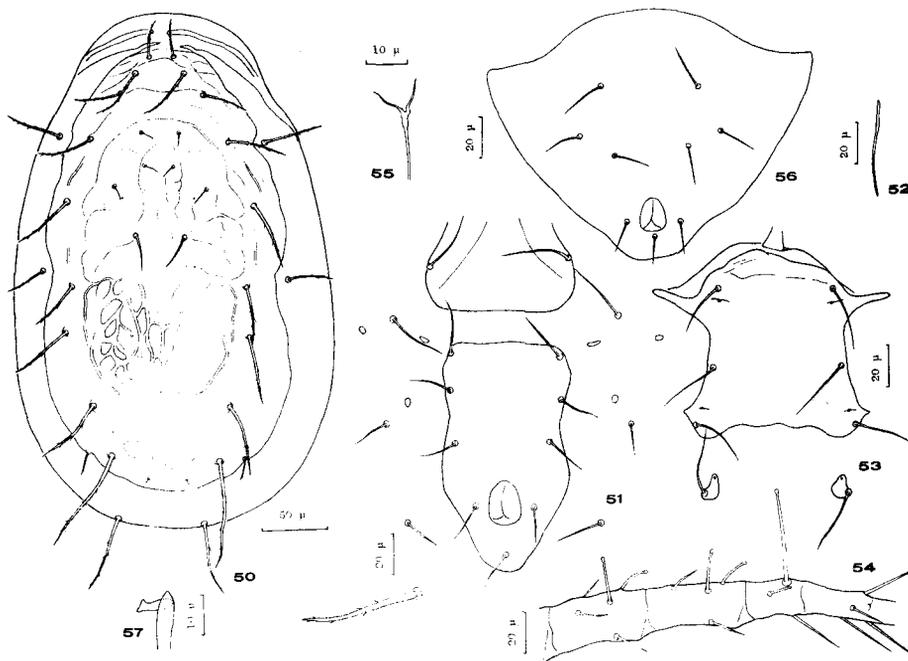
9. *Amblyseius (Kampimodromus) maritimus* n. sp.

(Jap. name: Hamanasu-kaburidani)

(Figs. 50-57)

Female. Dorsal shield rugose, with five pairs of dorsocentral setae (seta D_5 absent). Dorsal setae barbed except setae D_2 to D_6 and M_1 which are nude; D_2 , D_3 , and D_6 very small, remaining setae more or less stout; L_8 approximately in a transverse line with L_9 . Peritremes extending beyond setae D_1 . Sternal shield with three pairs of setae; metasternal platelets as figured. Ventrianal shield much longer than wide, slightly narrower than genital shield; three pairs of preanal setae

nearly in a longitudinal line; no pores. Four pairs of setae surrounding ventrianal shield, seta VL_1 stout, barbed. A pair of reduced, filamentous metapodal platelets. Spermatheca as illustrated. Fixed digit of chelicera with a few teeth. Genu IV, tibia IV, and basitarsus IV each with a capitate macroseta; distitarsus IV with a similar, weak macroseta; genu IV, tibia IV, and basitarsus IV each with one or more capitate to blunt setae. Measurements in microns: idiosoma length 400, idiosoma width 280; lengths of setae: L_1 42, L_2 39, L_3 47, L_4 52, L_5 43, L_6 53, L_8 25, L_9 79, M_1 17, M_2 57, D_1 29, D_2 12, D_3 12, D_4 29, D_6 5, S_1 47, S_2 35, VL_1 56, macrosetae of leg IV: genu 20, tibia 18, basitarsus 43, distitarsus 27.



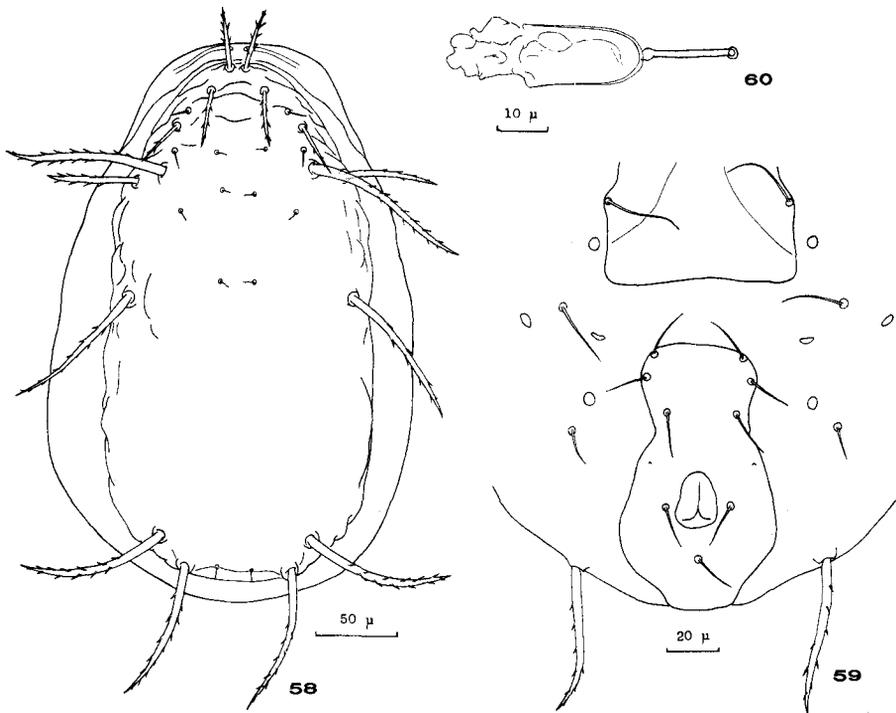
Figs. 50–57. *Amblyseius (Kampimodromus) maritimus* n. sp. 50, dorsum of idiosoma (♀). 51, posterior ventral surface (♀). 52, left metapodal platelet (♀). 53, sternal shield (♀). 54, genu, tibia and tarsus of leg IV (♀). 55, spermatheca. 56, ventrianal shield (♂). 57, spermatophoral process of ♂ chelicera.

Male. Setae S_1 and S_2 on dorsal shield. Ventrianal shield with three pairs of preanal setae. Spermatophoral process of chelicera as illustrated. Genu IV, tibia IV, and basitarsus IV each with two capitate setae including macroseta; distitarsus IV with a blunt macroseta. Measurements in microns: idiosoma length 280, idiosoma width 190; lengths of setae: L_1 34, L_2 30, L_3 35, L_4 40, L_5 29, L_6 36, L_8 13, L_9 58, M_1 12, M_2 40, D_1 24, D_2 9, D_3 10, D_4 21, D_6 4, S_1 38, S_2 27, VL_1 32, macrosetae of leg IV: genu 18, tibia 16, basitarsus 33, distitarsus 23.

Types. Holotype (♀) and allotype (♂): Hamakoshimizu, Prov. Abashiri, 29-VIII-1966 (H. Tamura leg.), on *Rosa rugosa* Thunb. Paratypes: 4 ♀♀ & 4 ♂♂, data same as for holotype; 1 ♀, 21-VI-1966 (T. Matsumura leg.), other data same as for holotype; 16 ♀♀ & 2 ♂♂, 14-IX-1966 (H. Fukuda leg.), other data same as for holotype. These type specimens were collected on leaves and galls of this plant. These galls were produced by a cynipid wasp *Liebelia* (*Nipporhodites*) *fukudae* Shinji.

In addition to these types a female specimen taken from Mombetsu (Prov. Hidaka), though in poor condition, is now referred to the present new species. Other data of this specimen are: July 23-24, 1966 (N. Kishi leg.), on *Athyrium brevifrons* Nakai.

Remarks. This new species can be separated from *Amblyseius* (*Kampimodromus*) *aberrans* (Oudemans, 1930a), *A. (K.) irregularis* (Evans, 1953), and *A. (K.) judaicus* Swirski and Amitai, 1961, by the absence of seta D_5 , and by other many characters.



Figs. 58-60. *Phytoseius* (*Phytoseius*) *nipponicus* Ehara. 58, dorsum of idiosoma (♀). 59, posterior ventral surface (♀). 60, spermatheca.

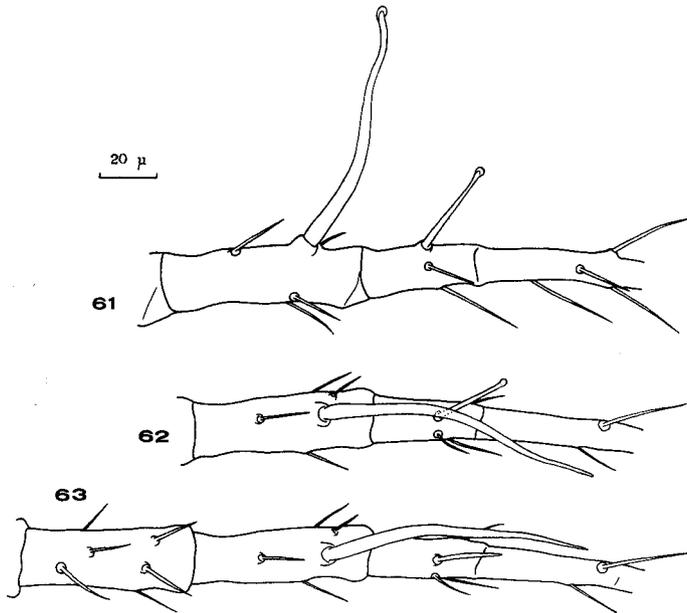
10. *Phytoseius (Phytoseius) nipponicus* Ehara

(Figs. 58-63)

Phytoseius (Dubininellus) nipponicus Ehara, 1962, p. 55, Figs. 7-11; Denmark, 1966, p. 90, Fig. 38.

Phytoseius (Phytoseius) nipponicus, Ehara, 1966, p. 26.

Phytoseius nipponicus has been known only from Honshu, and it is new to Hokkaido. The macrosetae of leg IV of the female show much intraspecific variation in tip feature. Both sexes of the type specimens (type locality: Den-en-chôfu, Tokyo) have two capitate macrosetae on leg IV. These macrosetae, however, are tapering (more or less blunt-ended) in many female specimens from Hokkaido while they are capitate in females from Mombetsu, Prov. Hidaka. That the specimens of these two groups belong to the same species is acceptable from the following facts: 1) Intermediate female specimens regarding to macrosetae on leg IV were occasionally found; 2) A female with two capitate macrosetae on leg



Figs. 61-63. *Phytoseius (Phytoseius) nipponicus* Ehara. Leg IV (♀), showing variation of macrosetae.

IV occurred within a population of specimens having tapering macrosetae. On the other hand, leg IV of the male is provided constantly with two capitate macrosetae in all populations herein studied. At any rate, it is concluded that for recognition of phytoseiid species, at least those of *Phytoseius*, the shape of macroseta tips should not be emphasized too much.

Further, the lengths of some setae of this species are considerably variable among different specimens. The length ranges of main setae of Hokkaido specimens (in microns) are: *female*: L₅ 81–113, L₆ 80–99, L₇ 64–87, M₂ 65–90, macroseta of tibia IV 73–94, macroseta of basitarsus IV 21–32; *male*: L₅ 54–62, L₆ 48–58, L₇ 36–48, M₂ 36–45, macroseta of tibia IV 58–91, macroseta of basitarsus IV 21–26.

Specimens from Hokkaido. Many specimens (♀ ♀ & ♂ ♂) collected in Sapporo and its vicinity by Mr. N. Kishi are from the following plants: *Filipendula kamtschatica* (Pall.) Maxim., *Helianthus tuberosus* L., *Morus bombycis* Koidz., *Sambucus sieboldiana* Blume var. *miquelii* (Nakai) Hara, *Urtica platyphylla* Wedd., and *Vitis coignetiae* Pulliat.

Materials from other localities: one female collected from mulberry at Toyotomi, Sarobetsu wasteland, by Dr. H. Mori *et al.*; a few specimens (♀ ♀ & ♂ ♂) collected at Mombetsu, Prov. Hidaka, by Mr. N. Kishi from *Aralia cordata* Thunb., *Cirsium kamtschaticum* Ledeb., and *Quercus dentata* Thunb.; two females taken from *Rosa rugosa* Thunb. (leaves or galls¹⁾) at Hamakoshimizu, Prov. Abashiri, by Mr. T. Matsumura and Mr. H. Tamura.

11. *Phytoseius (Phytoseius) kishii* n. sp.

(Jap. name: Hokkai-kaburidani)

(Figs. 64–67)

Female. Dorsal shield rugose, with five pairs of dorsocentral setae (seta D₅ absent). Setae on dorsal shield anchored on tubercles; L₁, L₃, L₅, L₆, L₇, M₂, D₁, and S₁ stout, strongly serrate; L₁ and S₁ approximately equal-sized, larger than D₁ and L₃ which are about equal-sized; L₇ close to M₂; L₂ and L₄ practically smooth; D₂ to D₄, D₆, and M₁ minute. Peritremes not extending between setae D₁. Sternal shield with three pairs of setae; metasternal setae on small platelets. Ventrianal shield much longer than wide, and much narrower than genital shield; the lateral margins strongly concave; three pairs of preanal setae. Three pairs of setae surrounding ventrianal shield, seta VL₁ stout, strongly serrate. A pair of slender metapodal platelets. Spermatheca as illustrated. Fixed digit of chelicera with a few teeth. Tibia IV with a spatulate macroseta, the tip with a very narrow hyaline envelope; genu IV and basitarsus IV each with a more or less blunt-ended macroseta, distitarsus IV with a similar, weak macroseta. Measurements in microns: idiosoma length 350, idiosoma width 240; lengths of setae: L₁ 42, L₂ 18, L₃ 32, L₄ 18, L₅ 97, L₆ 66, L₇ 68, M₁ 5, M₂ 74, D₁ 31, D₂ 5, D₃ 4, D₄ 5, D₆ 6, S₁ 43, VL₁ 44, macrosetae of leg IV: genu 17, tibia 42, basitarsus 25, distitarsus 26.

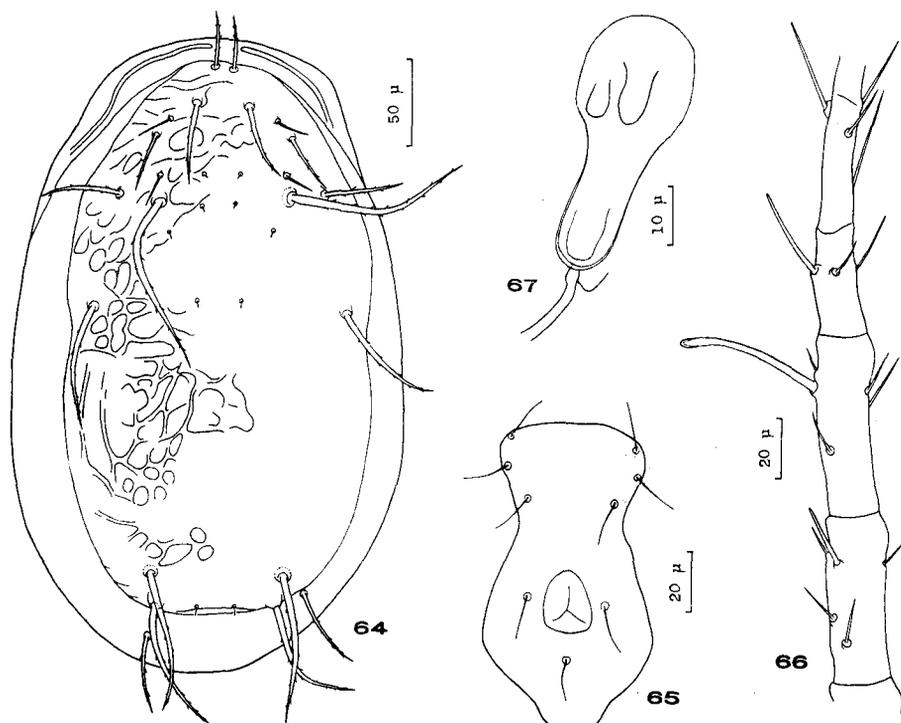
Male. Not known.

Types. Holotype: ♀, Sapporo, 5-VI-1966 (N. Kishi leg.), on *Vitis coignetiae* Pulliat. Paratypes: 5 ♀ ♀, data same as for holotype.

Remarks. *Phytoseius (P.) kishii* n. sp. is closely allied to *P. (P.) corniger*

1) Produced by a cynipid wasp *Liebelia (Nipporhodites) fukudae* Shinji.

Wainstein, 1959, but is different from the latter in the relative lengths of setae L_1 and S_1 , and of setae L_2 and L_4 . *P. (P.) kishii* n. sp. is also similar to *P. (P.) horridus* Ribaga, 1902, but is distinctive from it in the relative lengths of the segments and macrosetae of leg IV and in the shape of the spermatheca (Chant and Athias-Henriot, 1960; Denmark, 1966). This new mite is named in honor of Mr. Nobuo Kishi who kindly submitted many specimens of mites for this study.



Figs. 64–67. *Phytoseius (Phytoseius) kishii* n. sp. 64, dorsum of idiosoma (♀). 65, ventrianal shield (♀). 66, genu, tibia and tarsus of leg IV (♀). 67, spermatheca.

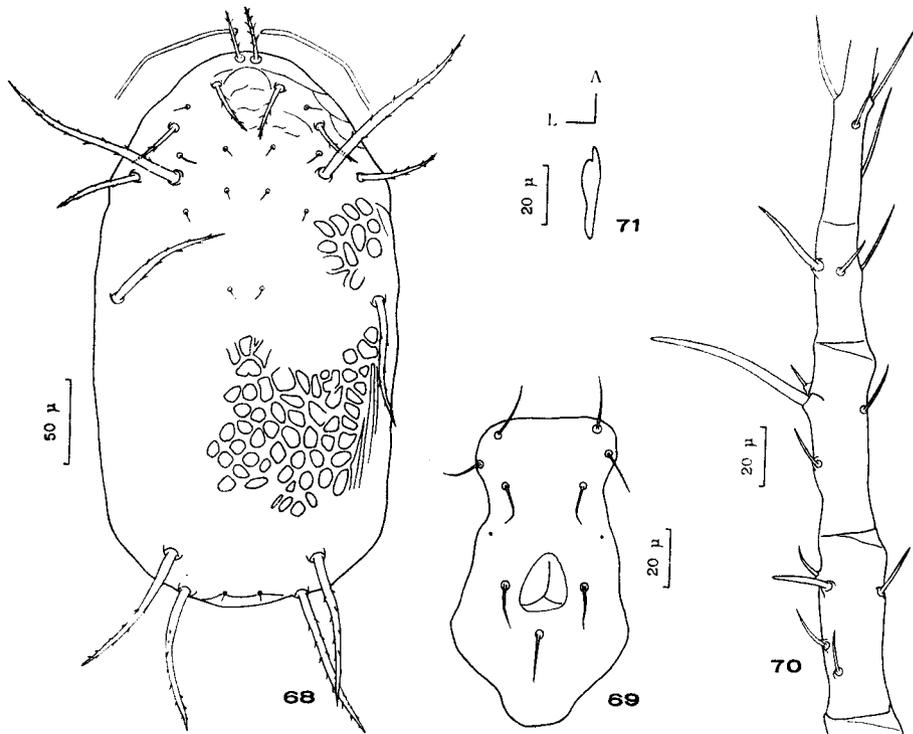
12. *Phytoseius (Phytoseius) campestris* n. sp.

(Jap. name: Sōya-kaburidani)

(Figs. 68–71)

Female. Dorsal shield rugose, with five pairs of dorsocentral setae (seta D_5 absent). Setae on dorsal shield arising from tubercles; L_1 , L_3 , L_5 , L_6 , L_7 , M_2 , D_1 , and S_1 stout, strongly serrate, S_1 much longer than L_1 , L_3 , and D_1 ; L_7 close to M_2 ; L_2 and L_4 practically smooth; D_2 to D_4 , D_6 , and M_1 minute. Peritreme extending forward to seta D_1 . Sternal shield with three pairs of setae; metasternal setae on

small platelets. Ventrianal shield slender, narrower than genital shield, concave laterally, with three pairs of preanal setae and a pair of minute pores. Three pairs of setae on membrane surrounding ventrianal shield, seta VL_1 stout, strongly serrate. A pair of slender metapodal platelets. Cervix of spermatheca U-shaped, about 11μ wide; atrium and major duct, combined lengths, at least 18μ . Genu IV, tibia IV, and basitarsus IV each with a blunt-ended macroseta; distitarsus IV with



Figs. 68-71. *Phytoseius (Phytoseius) campestris* n. sp. 68, dorsum of idiosoma (♀). 69, ventrianal shield (♀). 70, genu, tibia and tarsus of leg IV (♀). 71, metapodal platelet (♀) (A, anterior direction; L, lateral direction).

a similar macroseta. Measurements in microns: idiosoma length 400, idiosoma width 240; lengths of setae: L_1 31, L_2 12, L_3 32, L_4 14, L_5 107, L_6 70, L_7 84, M_1 8, M_2 82, D_1 29, D_2 7, D_3 7, D_4 8, D_6 6, S_1 46, VL_1 58, macrosetae of leg IV: genu 19, tibia 56, basitarsus 29, distitarsus 29.

Male. Not known.

Type. Holotype: ♀, Toyotomi, Sarobetsu wasteland, 12~14-VII-1966 (H. Mori *et al.* leg.), on *Kalopanax pictus* (Thunb.).

Remarks. *Phytoseius (P.) campestris* n. sp. is closely allied to *P. (P.) corniger*

Wainstein, 1959, and *P. (P.) horridus* Ribaga, 1902, but is distinct from these species in the relative lengths of setae S_1 , L_1 , L_3 , and D_1 .

Key to species of Phytoseiidae found in Hokkaido (females)

1. Setae S_1 and S_2 on interscutal membrane..... 2
 - Seta S_1 on dorsal shield, seta S_2 absent..... 16
2. Proscutum with 6 pairs of lateral setae..... 3
 - Proscutum with 4 pairs of lateral setae..... 4
3. Seta M_2 longer than L_8 *Typhlodromus (Anthoseius) vulgaris* Eh.
 - Seta M_2 subequal in length to L_8 *Typhlodromus (Anthoseius) borealis* Eh.
4. Seta M_2 more or less in a transverse line with L_7 5
 - Seta M_2 not in a transverse line with any lateral setae.....
 - *Amblyseius (Kampimodromus) maritimus* Eh.
5. Setae D_2 to D_5 shorter than distances between their bases..... 6
 - Setae D_2 to D_5 longer than distances between their bases.....
 - *Amblyseius (Amblyseius) longispinosus* (Evans)
6. Three pairs of preanal setae not in a transverse line; peritreme long, extending more or less near seta D_1 7
 - Three pairs of preanal setae more or less in a transverse line; peritreme short, reaching only to coxa II. *Amblyseius (Amblyseius) finlandicus* (Oudemans)
7. None of the prolateral setae three times as long as D_2 and D_3 8
 - One or more of the prolateral setae at least three times as long as D_2 and D_3 .
 - 11
8. Seta L_4 less than twice as long as L_3 and L_6 9
 - Seta L_4 about twice as long as L_3 and L_6
 - *Amblyseius (Amblyseius) ainu* Eh.
9. Seta M_2 shorter than distance between its base and that of L_9 10
 - Seta M_2 longer than distance between its base and that of L_9
 - *Amblyseius (Amblyseius) oguroi* Eh.
10. Seta L_7 approximately half as long as M_2
 - *Amblyseius (Amblyseius) haimatus* Eh.
 - Seta L_7 slightly shorter than M_2 *Amblyseius (Amblyseius) paraki* Eh.
11. Seta L_6 similar in length to L_5 12
 - Seta L_6 noticeably longer than L_5 *Amblyseius (Amblyseius) morii* Eh.
12. Ventrianal shield with the posteriormost pair of preanal setae and pores on anterior one-third of preanal region.... *Amblyseius (Amblyseius) ezoensis* Eh.
 - Ventrianal shield with the posteriormost preanal setae and pores not on anterior one-third of preanal region..... 13
13. Seta L_9 greatly longer than M_2 14
 - Seta L_9 only slightly longer than M_2

- *Amblyseius (Amblyseius) rademacheri* Dosse¹⁾
14. Macroseta of basitarsus IV shorter than that of genu IV..... 15
 - Macroseta of basitarsus IV longer than that of genu IV.....
 *Amblyseius (Amblyseius) tsugawai* Eh.
15. Seta L₁ longer than D₁; L₉ approximately twice as long as M₂.....
 *Amblyseius (Amblyseius) orientalis* Eh.²⁾
 - Seta L₁ approximately as long as D₁; L₉ about 1.5 times as long as M₂.
 *Amblyseius (Amblyseius) firmus* Eh.
16. Ventrianal shield with three pairs of preanal setae..... 17
 - Ventrianal shield with one pair of preanal setae.
 *Phytoseius (Phytoseius) blakistoni* Eh.
17. Genu IV with a macroseta 18
 - Genu IV without macroseta *Phytoseius (Phytoseius) nipponicus* Eh.
18. Setae S₁ and L₁ subequal in length. *Phytoseius (Phytoseius) kishii* Eh.
 - Seta S₁ noticeably longer than L₁.... *Phytoseius (Phytoseius) campestris* Eh.

Summary

1. This paper deals with descriptions and records of twelve species belonging to the family Phytoseiidae from Hokkaido.

2. The following ten species are described as new: *Typhlodromus (Anthoseius) borealis*, *Amblyseius (Amblyseius) haimatus*, *A. (A.) paraki*, *A. (A.) anu*, *A. (A.) morii*, *A. (A.) firmus*, *A. (A.) ezoensis*, *Amblyseius (Kampimodromus) maritimus*, *Phytoseius (Phytoseius) kishii*, *P. (P.) campestris*.

3. *Amblyseius (Amblyseius) tsugawai* Ehara, and *Phytoseius (Phytoseius) nipponicus* Ehara are first recorded from Hokkaido.

4. The macrosetae of female leg IV of *P. (P.) nipponicus* show much intraspecific variation in tip feature.

5. A key to the species of phytoseiids of Hokkaido is given.

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1) In a previous paper (Ehara, 1959) the length of female seta L₉ of *A. rademacheri* was erroneously described. The length measurements of main dorsal setae of female *rademacheri* are: L₄ 62μ, L₉ 98 μ, and M₂ 87 μ.

2) Length measurements of main dorsal setae of *A. orientalis* (female): L₄ 92μ, L₉ 230 μ, M₂ 115μ.

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