Records of Ten Eriophyid Mites Associated with Plants in Japan[1)]

By

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(*With 64 Text-figures*)

The taxonomical reports on eriophyid mites have been rarely seen from Japan up to the present. The writer (1965) reported five species of eriophyid mites on elm in Sapporo (Japan) and the present paper is his second report concerning the Japanese eriophyid mites. The material on which this paper is based was collected on miscellaneous plants from several localities in Japan and submitted to the writer for identification. On examination, it has been made clear that the present material contains the following ten species belonging to three subfamilies in two families:

Family Eriophyidae
- Subfamily Eriophyinae
  1. *Aceria japonica* n. sp.
  2. *Aceria macrodonis* Keifer
  3. *Aceria paradianthi* Keifer
- Subfamily Phyllocoptinae
  4. *Aculops chinonei* n. sp.
  5. *Aculops niphocladae* Keifer
  6. *Aculops pelekassi* (Keifer)
  7. *Calacarus carinatus* (Green)
  8. *Epitrimerus pyri* (Nalepa)
  9. *Phyllocoptes carilubi* Keifer

Family Phytoptidae
- Subfamily Nalepellinae
  10. *Trisetacus pini* (Nalepa)

Among the species here treated, two are new to science, another six new to Japan, and two species, though already recorded from this country, are redescribed

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in order to cover the insufficient previous descriptions. The type specimens of the new species are deposited in the Zoological Institute, Faculty of Science, Hokkaido University.

The descriptive terms used are those of Hassan (1928) and Keifer (1952b). As to the classification, Keifer's system (1964) is followed in this paper.

Superfamily ERIOPHYOIDEA
Key to Ten Eriophyid Mites in Japan[1)]

1. Cephalothoracic shield with two or no setae; without subdorsal abdominal setae; with a pattern of ribs on female genital coverflap ..... Fam. Eriophyidae, 2
–. Cephalothoracic shield with three or four setae; two subdorsal abdominal setae, present or absent; without ribs on female genital coverflap..... Fam. Phytoptidae, 2
2. Wormlike; with similar rings dorso-ventrally; shield without anterior lobe; chelicera evenly curved when the rostrum is large..... Subfam. Eriophyinae, 3
–. Fusiform usually; tergite broader and fewer than sternites; or anterior shield lobe over rostrum; or with large and tapering rostrum, and abruptly bent downward chelicera ..... Subfam. Phyllocoptinae, 4
3. Dorsal shield setae present, pointing backward from rear shield margin, featherclaw 3–rayed; on Japanese chestnut ..... *Aceria japonica* n. sp.
–. Featherclaw 5–rayed; on Chinese box-thorn ..... *Aceria macrodonis* K.
–. Featherclaw 7–rayed; on carnation ..... *Aceria paradianthi* K.
4. Dorsal shield setae absent..... *Calacarus carinatus* (G.)
–. Dorsal shield setae present..... 5
5. Dorsal shield setae arising from ahead of rear shield margin and projecting upward or dorsocentrad..... 6
–. Dorsal shield setae arising from the rear margin and projecting backward 7
6. Abdomen circular, featherclaw 5–rayed ..... *Phyllocoptes carilubi* K.
–. Abdomen flattened, featherclaw 4–rayed..... *Epitrimerus pyri* (Nal.)
7. Curved spindleform, genital setae nearly as long as the width of genitalia, a pretty difference of breadth between tergite and sternite..... ..... *Aculops chinonei* n. sp.
–. Fusiform, genital setae more than two times the width of genitalia, a little difference of breadth between tergite and sternite..... 8
8. Tergites with microtubercles ..... *Aculops niphocladae* K.
–. Tergites lacking microtubercles ..... *Aculops pelekassi* (K.)
9. Body cylindrical-elongate, with three cephalothoracic setae and a pair of subdorsal abdominal setae ....Subfam. Nalepellinae, *Trisetacus pini* (Nal.)

1) Characters for the key are only on related materials of this paper.

Aceria Keifer

Aceria Keifer, 1944, p. 22.

(1) *Aceria japonica* n. sp.
(Figs. 1–8)

Female. Body cylindrical vermiform, orange colored (viz. reddish-yellow). Rostrum projecting downward. Shield rather semicircular anteriorly; ratio of width/length 1.9; disk with a short dash-like median line setting just of the rear; admedians complete, the distance between which on rear edge taking about one third of the interval between dorsal tubercles; submedians present, the rear parts of inner two pairs standing thick obviously; dorsal tubercles 15.1–15.9μ apart, on rear edge of shield; dorsal setae 18.1–19.8μ long, directed backward. Abdomen microtuberculated except on the dorsum of about rear 10 rings; with 44–45 tergites and 40–41 sternites; breadth[1] of tergite 4.5μ, sternite 4.9μ. Relative lengths of segments of fore-leg: tarsus>tibia$\geqq$claw>featherclaw; hind-leg, claw$\geqq$tarsus>tibia; claw a little curved, with a small terminal knob; featherclaw 3-rayed. Genitalia 16.1–17.4μ wide, 8.9–9.9μ long; genital coverflap with few irregular ribs. Intervals "ts_1–ts_1" & ts_2–ts_2", "ts_1–ts_2 & ts_2–ts_3" and "vs_2–vs_2 & vs_3–vs_3" are nearly in the same distances respectively. Relative lengths of setae; cs>ts_3>vs_1>$vs_3$$\geqq$ds>ls$\geqq$$ts_2$>$vs_2$>$ts_1$$\geqq$gs>acs. Setae gs on 3–4 sternites, ls on 6–7, vs_1 on 13–14, vs_2 on 21–22, vs_3 on 35–36. Ratio of length/interval between bases of pair ts_1=0.8, ts_2=2.2, ts_3=1.8, ds=1, ls=0.4, vs_1=0.9, vs_2=0.8, vs_3=1.2, acs=0.5, cs=0.5, gs=0.6. Average measurements in micra (n=5): body length 175.3, thickness 46, width 47.1; shield length 20.7, width 39.1; lengths: fore-leg, tibia 6.2, tarsus 7.8, claw 5.9, featherclaw 4.8; hind-leg, tibia 4.9, tarsus 6.4, claw 6.8; setae ts_1 6.1, ts_2 16.7, ts_3 31.7, ds 18.9, ls 16.8, vs_1 27.3, vs_2 13.4, vs_3 19.6, acs 4.1, cs 59.5, gs 5.9; intervals of setae ds-ds 19.7, ts_1-ts_1 7.7, ts_2-ts_2 7.5, ts_3-ts_3 17.5, gs-gs 9.8, ls-ls 43.3, vs_1-vs_1 31.6, vs_2-vs_2 16.4, vs_3-vs_3 16.3, cs-cs 12.8, acs-acs 8.5, ts_1-ts_2 6.5, ts_2-ts_3 6.6, ts_3-gs 17.3, gs-ls 16.6, ls-vs_1 32.4, vs_1-vs_2 38.9, vs_2-vs_3 54, cs-acs 2.2.

Male. Not available to the writer.

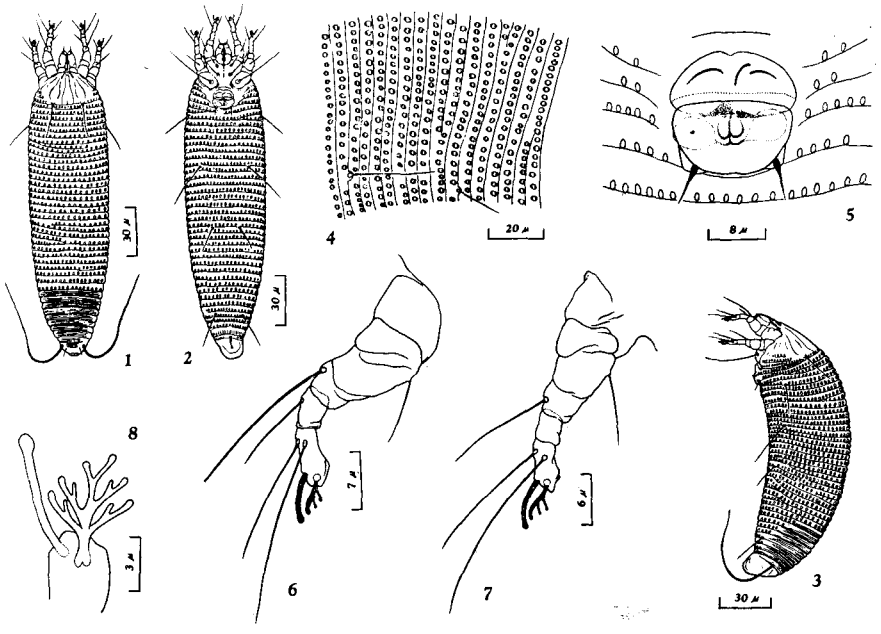
Specimens examined. Specimens on *Castanea crenata* Sieb. et Zucc. (Fagaceae) were collected at Tsukuba, Ibaragi Pref., Honshu, on Aug. 17, 1968, by S. Chinone.

Distribution and hosts. Japan (Honshu), on chestnut.

Remarks. The mites form grained galls on each side of leaves. A tiny pit as an entrance is present on the under-surface generally. The anterior shield margin of this mite is semicircular such as *Aceria sheldoni* (Ewing). The main features distinguishing this mite from others are the short dash-like median line

1) Average breadth of three ventral rings, consisting of the setiferous ring of the first ventral setae and its preceding and following rings for sternites, and the same of three dorsal rings at the opposite side of ventral rings for tergite.

on the rear shield edge and the inner two pairs of submedian lines, the rear parts of which are significantly thick.



Figs. 1–8. *Aceria japonica* n. sp., ♀. 1, dorsum. 2, venter. 3, lateral aspect. 4, side skin structure (left). 5, genitalia. 6, left anterior leg. 7, left posterior leg, 8, featherclaw.

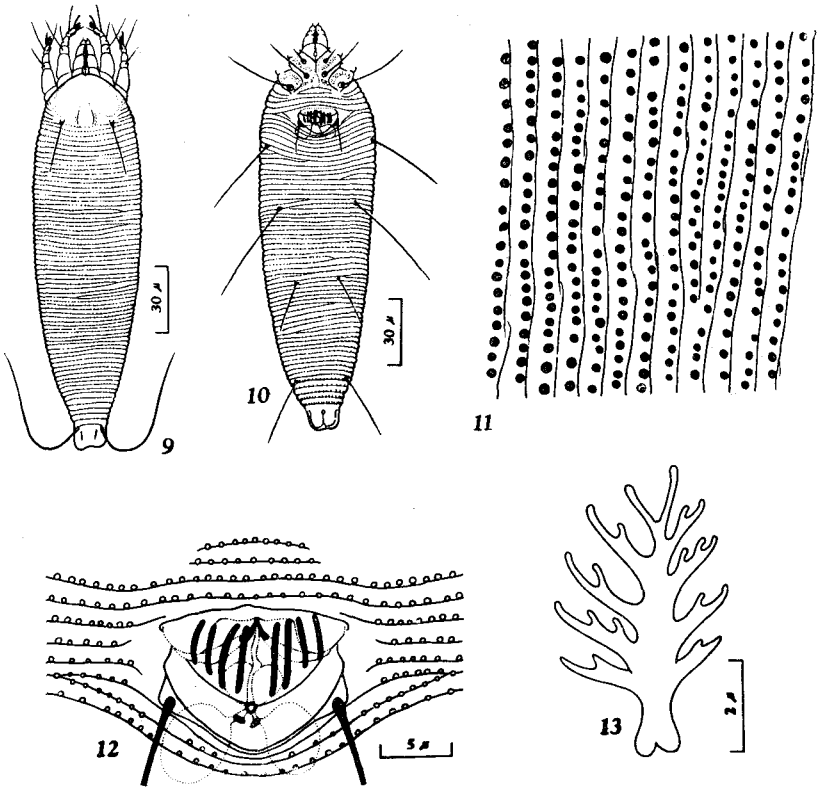
(2) *Aceria macrodonis* Keifer

(Figs. 9–13)

Aceria macrodonis Keifer, 1965, p. 13, pl. 6.

Female. Body elongate-wormlike, light yellowish-white in color. Rostrum rather curved down. Shield hemicircular anteriorly; ratio of width/length 1.2; shield design without median line, only a pair of rear part of admedian lines remaining and somewhat projecting exteriorly; granules on either side of shield and sorrounding the both sides and the rear of admedian lines; dorsal tubercles 17.9–19.3μ apart, on rear margin; dorsal setae 23.6–26μ long, projecting backward. Abdomen microtuberculated beadlikely, with 64–70 tergites and 63–69 sternites; breadth of tergite 2.6μ, sternite 2.7μ. Relative lengths of segments of fore-leg: claw$\geqq$tarsus$\geqq$tibia$\geqq$featherclaw; hind-leg, claw$\geqq$tarsus$\geqq$tibia; claw with a slight knob, featherclaw 5-rayed. Genitalia 17.4–18.6μ wide, 12.4–12.9μ long; genital coverflap with about 8 longitudinal ribs. Interval ts_2-ts_2 a little shorter than distance ts_1-ts_2. Relative lengths of setae: $cs>vs_1>ls\geqq ts_3\geqq vs_3>ds\geqq vs_2\geqq ts_2>$

gs>ts_1>acs. Setae gs on 5–6 sternite, ls on 10–11, vs_1 on 22–25, vs_2 on 36–42, vs_3 on 57–64. Ratio of length/interval between bases of pair ts_1=0.8, ts_2=3.8, ts_3=1.7, ds=1.2, ls=0.9, vs_1=1.6, vs_2=1.4, vs_3=1.3, acs=0.7, cs=6.4, gs=0.8. Average measurements in micra (n=5): body length 170.9, thickness 54.4, width 55.6; shield length 26.6, width 32.3; lengths: fore-leg, tibia 6.1, tarsus 6.4, claw 6.5, featherclaw 5.5; hind-leg, tibia 5.2, tarsus 5.8, claw 6.2; setae ts_1 7.0, ts_2 22.2, ts_3 33.1, ds 24.9, ls 36.7, vs_1 49.6, vs_2 23.9, vs_3 31.1, acs 5.3, cs 63.5, gs 12.9; intervals of setae ds-ds 20.5, ts_1-ts_1 8.7, ts_2-ts_2 5.9, ts_3-ts_3 19.6, gs-gs 16.9, ls-ls 42.2, vs_1-vs_1 31.2, vs_2-vs_2 17.6, vs_3-vs_3 23.5, cs-cs 10, acs-acs 7.2, ts_1-ts_2 6.2, ts_2-ts_3 7.4, ts_3-gs 19.7, gs-ls 17, ls-vs_1 28.2, vs_1-vs_2 31.6, vs_2-vs_3 46.9, cs-acs 2.4.



Figs. 9–13. *Aceria macrodonis*, ♀. 9, dorsum. 10, venter. 11, side skin structure (left). 12, genitalia. 13, featherclaw.

Male. Not available to the writer.

Specimens examined. Specimens on *Lycium chinense* Miller (Solanaceae) at Mizukaido, Ibaragi Pref., Honshu, were collected on July 1, 1968, by S. Chinone.

Distribution and hosts. Japan (first record). U.S.A. (Keifer, 1965); on box thorn.

Remarks. The mite induces blisters on both sides of injured leaf which is always malformed, withered and hastened to fall. The mite is new to Japan.

(3) *Aceria paradianthi* Keifer
(Figs. 14–19)

Aceria paradianthi Keifer, 1952a, p. 65, pl. 211.

Female. Body wormlike, yellow colored. Rostrum down-curved. Shield roundish anteriorly; ratio of width/length 1.4; design of a trim network: median line missing an anterior part but connecting with two curved lines from admedians, a transverse line running across the shield at about 1/3 from the rear, two curved lines linking median line to admedians just above posterior margin; first submedians complete, connecting with admedians by anterior cross line and with transverse line by posterior cross line; second submedians incomplete; a defined granulated area on either sides of shield; dorsal tubercles 23.3–25.8μ apart, on rear margin; dorsal setae 19.8–22.8μ long, diverging to rear. Coxae with granules. Abdomen equally microtuberculated dorsoventrally, with 71–74 tergites and 71–73 sternites; breadth of tergite 2.5μ, sternite 2.6μ. Relative length of segments of fore-leg: tarsus$\geqq$claw$\geqq$tibia$\geqq$featherclaw; hind-leg, claw$>$tarsus$>$tibia; claw slightly curved and tapering, featherclaw 6-rayed. Genitalia 27.3–28.5μ wide, 17.9–18.8μ long; genital coverflap with about 14 longitudinal furrows. Intervals "ts_3-ts_3 & vs_3-vs_3" and "vs_1-vs_1 & vs_1-vs_2" are almost in the same distance separately. Relative lengths of setae: cs$>$$vs_1$$>$$ts_3$$\geqq$ls$\geqq$$vs_2$$\geqq$$vs_3$$>gs\geqq$$ts_2$$>ds>$$ts_1$$>$acs Setae gs on 5–6 sternites, ls on 10–11, vs_1 on 23–25, vs_2 on 40–43, vs_3 on 64–65. Ratio of length/interval between bases of pair ts_1=0.5, ts_2=2.4, ts_3=1.7, ds=0.7, ls=0.7, vs_1=1.2, vs_2=1.8, vs_3=1.5, acs=0.8, cs=7.5, gs=1.6. Average measurements in micra (n=5): body length 199.9, thickness 66.7, width 69.7; shield length 35.3, width 50.6; lengths: fore-leg, tibia 9.1, tarsus 10.1, claw 9.6, featherclaw 6.8; hind-leg, tibia 7.2, tarsus 8.3, claw 9.5; setae ts_1 7.5, ts_2 31.2, ts_3 49.1, ds 21.2, ls 47.1, vs_1 55.7, vs_2 46.1, vs_3 44.5, acs 5.9, cs 85.9, gs 36.2; intervals of setae ds-ds 30.3, ts_1-ts_1 14.5, ts_2-ts_2 12.9, ts_3-ts_3 29.4, gs-gs 22.1, ls-ls 64.2, vs_1-vs_1 48.4, vs_2-vs_2 25.3, vs_3-vs_3 29.8, cs-cs 11.5, acs-acs 7.3, ts_1-ts_2 7.6, ts_2-ts_3 9.6, ts_3-gs 27.5, gs-ls 24.1, ls-vs_1 38.8, vs_1-vs_2 48.8, vs_2-vs_3 53.1, cs-acs 2.3.

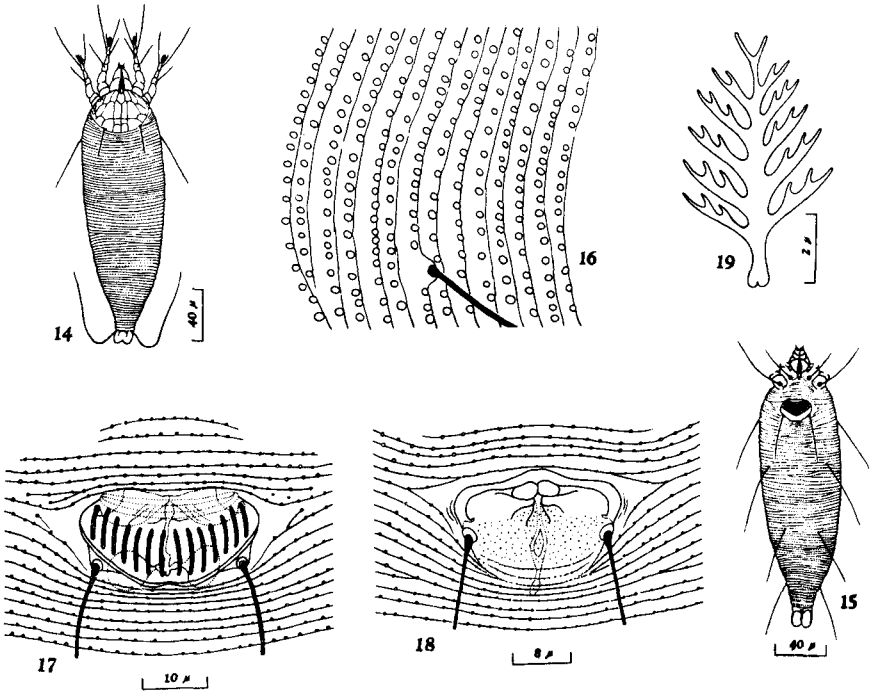
Male. Body 178.9μ long, 56.4μ thick, 59.6μ wide. Shield 31μ long, 44.6μ wide; dorsal tubercles 22.6–23.1μ apart; dorsal setae 16.3μ long, diverging backward. Abdomen with 66–67 tergites, 67–68 sternites; setae gs on fifth sternite, ls on 11–12, vs_1 on 22–24, vs_2 on 37–39, vs_3 on 60–61. Genitalia 23.2μ wide, 14.7μ long; genital setae 23.6μ long, 20.9μ apart.

Specimens examined. Specimens on *Dianthus Caryophyllus* Linn. (Caryophyllaceae) were collected at Shizuoka, Shizuoka Pref., Honshu, on June 11, 1965, and Akashi, Hyogo Pref., Honshu, on Jan. 10, 1965, by the staffs of Agricultural

Experiment Stations there, and handed to the writer through S. Ehara.

Distribution and hosts. Japan (first record), U.S.A. (Keifer, 1952a); on carnation.

Remarks. The mites are vagrants on the undersurface of leaves, making it somewhat yellowish. This mite is new to Japan.



Figs. 14–19. *Aceria paradianthi*. 14, dorsum, ♀. 15, venter, ♀. 16, side skin structure (left), ♀. 17, genitalia, ♀. 18, genitalia, ♂. 19, featherclaw, ♀.

Calacarus Keifer

Calacarus Keifer, 1940, p. 163.

(4) *Calacarus carinatus* (Green)

(Figs. 20–24)

Typhlodromus carinatus Green, 1890, in Insect Pests of Tea Plant.

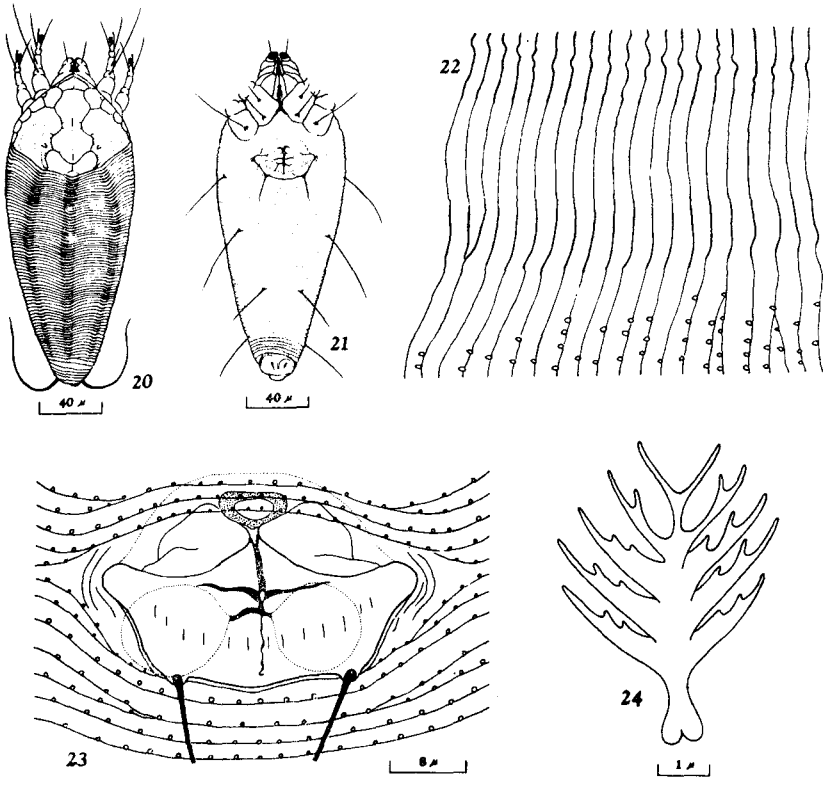
Phytoptus theae Watt and Mann, 1903, The Pests and Blights of the Tea Plant, p. 366.

Eriophyes carinatus (Green), Nalepa, 1929, Marcellia 25: 133; King, 1937, Bul. Ent. Res. 28: 311–314.

Epitrimerus adornatus Keifer, 1940, Bul. Cal. Dept. Agr. 29: 32, pl. 134.

Calacarus adornatus (Keifer), Keifer, 1940, p. 164; 1952b, p. 41.
Calacarus carinatus (Green), Keifer, 1955, p. 115.

Female. Body of a strong-looking, flattened form; deep reddish-purple in color. Rostrum relatively large, curved down. Shield comparatively large; ratio of width/length 1.2; an eight-shaped figure is formed longitudinally by admedian lines in the central region and a design of cells is formed symmetrically on both sides by lateral lines; dorsal tubercles rudimentally present, 34.7–37.2μ apart, in front of rear margin; dorsal setae absent. Abdomen with dorsal, subdorsal and lateral tergal ridges, forming four longitudinal furrows, lacking tubercles on tergites, possessing 67–69 tergites and 74–78 sternites; breadth of tergite 2.8μ, sternite 2.1μ. Relative lengths of segments of fore-leg: tibia>claw$\geqq$tarsus>featherclaw; hind-leg, tibia>claw$\geqq$tarsus; claw with passably large knob and curved, featherclaw 5-rayed. Genitalia 32.2–36μ wide, 19.8–21.3μ long; genital coverflap with many faint short lines. Intervals "cs-cs & ts_2-ts_2" and "ts_3-gs & ls-vs_1" are close



Figs. 20–24. *Calacarus carinatus*, ♀. 20, dorsum. 21, venter. 22, side skin structure (left). 23, genitalia. 24, featherclaw.

on the same distance individually; vs_1-vs_2 is only a little way off than vs_2-vs_3. Relative lengths of setae: $cs > vs_1 > ts_3 > ls \geqq vs_3 > vs_2 > ts_2 \geqq gs > ts_1$; acs missing. Setae gs on 5–6 sternites, ls on 10–11, vs_1 on 28–29, vs_2 on 51–53, vs_3 on 68–72. Ratio of length/interval between bases of pair $ts_1=0.9$, $ts_2=1.4$, $ts_3=1.1$, $ls=0.6$, $vs_1=1.1$, $vs_2=1.6$, $vs_3=1.2$, $cs=4.9$, $gs=1$. Average measurements in micra (n=5): body length 197.3, thickness 58, width 85.8; shield length 63.2, width 78.6; lengths: fore-leg, tibia 12.4, tarsus 9, claw 9.3, featherclaw 4.9; hind-leg, tibia 9.9, tarsus 7.8, claw 7.9; setae ts_1 14.2, ts_2 17.4, ts_3 42.5, ls 36.7, vs_1 49.6, vs_2 31, vs_3 34.8, cs 61.3, gs 16.5; intervals of setae ts_1-ts_1 15.9, ts_2-ts_2 12.3, ts_3-ts_3 37.2, gs-gs 17.3, ls-ls 65.1, vs_1-vs_1 43.2, vs_2-vs_2 19.4, vs_3-vs_3 29.2, cs-cs 12.5, ts_1-ts_2 11.8, ts_2-ts_3 13.7, ts_3-gs 32.2, gs-ls 23.3, ls-vs_1 32.7, vs_1-vs_2 39.9, vs_2-vs_3 38; interval of dorsal tubercles 35.8.

Male. Not available to the writer.

Specimens examined. Specimens on *Thea sinensis* Linn. (Camelliaceae) at Iwai, Sashima, Ibaragi Pref., Honshu, were collected on Oct. 14, 1968, by S. Chinone.

Distribution and hosts. Japan (Minamikawa, 1950, 1955, 1957a, 1957b; Hu, 1964), China (Minamikawa, 1951; Hu, 1964), India (Watt, 1898; Das & Segupta, 1963; Hu, 1964), Ceylon (Keifer, 1955; Cranham, 1960; Hu, 1964), U.S.A. (Keifer, 1940, 1952b, 1955), U.S.S.R. (Minamikawa, 1959; Hu, 1964); on tea.

Remarks. The mites live on both surfaces of leaves, resulting a dark purplish-brown vestige on leaves, and also leaving evident molted skins with white streaks on them.

Phyllocoptes **Nalepa**

Phyllocoptes Nalepa, 1889, Sitzb. Akad. Wiss. math.-nat. Wien. 98: 148.

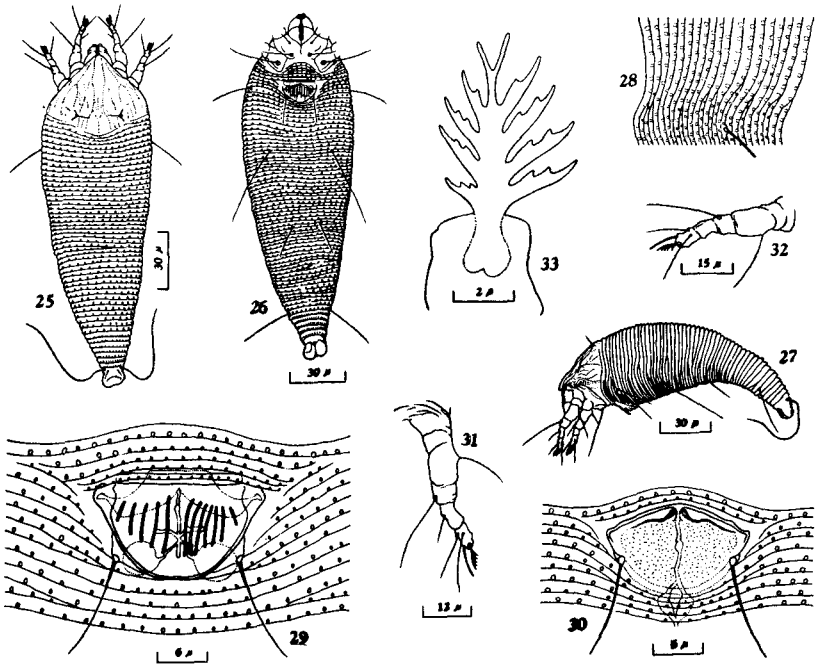
(5) ***Phyllocoptes carilubi*** **Keifer**

(Figs. 25–33)

Phyllocoptes carilubi Keifer, 1938b, p. 306; 1952b, p. 51.

Female. Body flattened-spindleform, amber (clear yellowish-brown) in color. Rostrum curved downwards. Shield with an anterior lobe, subtriangular, sparsely granulated, rear margin slightly arched backward; ratio of width/length 1.2; a design with complete admedian lines which connect a short thin median line with inside running branches forming a nearly Y-figure at ahead of rear; dorsal tubercles 15.1–15.6μ apart, a little anteriorly; dorsal setae 6.9–7.4μ long, directing dorso-centrally. Abdomen microtuberculated entirely, with 48–54 tergites and 70–74 sternites; breadth of tergite 2.6μ, sternite 2.3μ. Relative lengths of segments of fore-leg: claw$\geqq$tibia$\geqq$tarsus$\geqq$featherclaw; hind-leg, claw>tarsus>tibia; claw without knob, featherclaw 5-rayed. Genitalia 18.6–23.6μ wide, 12.4–13.6μ long; genital coverflap with 10–12 longitudinal ridges. Intervals "cs-cs & ts_1-ts_2", "acs-acs & ts_2-ts_2" and "vs_3-vs_3 & gs-ls" are very close on the same distance respectively; gs-gs is only a little longer than vs_2-vs_2. Relative lengths of setae:

cs>vs_1>vs_3≧ts_3>ls>vs_2>ts_2≧gs>ds>ts_1>acs. Setae gs on 5–6 sternites, ls on 9–11, vs_1 on 25–28, vs_2 on 45–47, vs_3 on 64–68. Ratio of length/interval between bases of pair ts_1=0.5, ts_2=1.9, ts_3=1.3, ds=0.4, ls=0.4, vs_1=1.2, vs_2=1.3, vs_3=1.4, acs=0.5, cs=6, gs=0.9. Average measurements in micra (n=5): body length 174.9, thickness 45, width 54.7; shield length 40.2, width 49.6; lengths: fore-leg, tibia 6.6, tarsus 6.2, claw 6.6, featherclaw 5.8; hind-leg, tibia 5.8, tarsus 6.4, claw 7.2; setae ts_1 5.9, ts_2 14.8, ts_3 28.6, ds 7.2, ls 21.7, vs_1 42, vs_2 17.3, vs_3 28.9, acs 3.9, cs 51, gs 13.2; intervals of setae ds-ds 17.2, ts_1-ts_1 10.9, ts_2-ts_2 7.8, ts_3-ts_3 22.8, gs-gs 14.7, ls-ls 48.9, vs_1-vs_1 34.7, vs_2-vs_2 13.8, vs_3-vs_3 20.6, cs-cs 8.5, acs-acs 7.4, ts_1-ts_2 8.3, ts_2-ts_3 9.5, ts_3-gs 27.2, gs-ls 20.7, ls-vs_1 33.3, vs_1-vs_2 42.6, vs_2-vs_3 45.4, cs-acs 2.2.



Figs. 25–33. *Phyllocoptes carilubi*. 25, dorsum, ♀. 26, venter, ♀. 27, lateral aspect, ♀. 28, side skin structure (left), ♀. 29, genitalia, ♀. 30, genitalia, ♂. 31, left anterior leg, ♀. 32, left posterior leg, ♀. 33, featherclaw, ♀.

Male. Body 128.7μ long, 45.6μ thick, 51μ wide; dorsal tubercles 13.6–14.9μ apart; dorsal setae 5μ long, projecting dorso-centrally. Abdomen with 48–49 tergites, 61–64 sternites; setae gs on sixth sternite, ls on 10–11, vs_1 on 21–23, vs_2 on 36–39, vs_3 on 55–58. Genitalia 17.3μ wide, 14.3μ long; genital setae 11.9μ long, 13.3μ apart.

Specimens examined. Specimens on *Rubus palmatus* Thumb. (Rosaceae), at Mt. Tsukuba, Ibaragi Pref., Honshu, on Aug. 23, 1968, were collected by S. Chinone.

Distribution and hosts. Japan (first record), U.S.A. (Keifer, 1938b, 1952b); on raspberry.

Remarks. The writer received an information from the collector that round or irregular concavo-convexes which are covered thickly with villi were developed on both surfaces of the injured leaves. In this case, the species might belong to erinose mite. But according to Keifer (1938b), the mite was as the vagrant on the underside of leaves of *Rubus vitifolius*. Though the difference of the injury may be originated in either locality or host, it is remained and expected in later study.

Epitrimerus **Nalepa**

Epitrimerus Nalepa, 1898, p. 61.

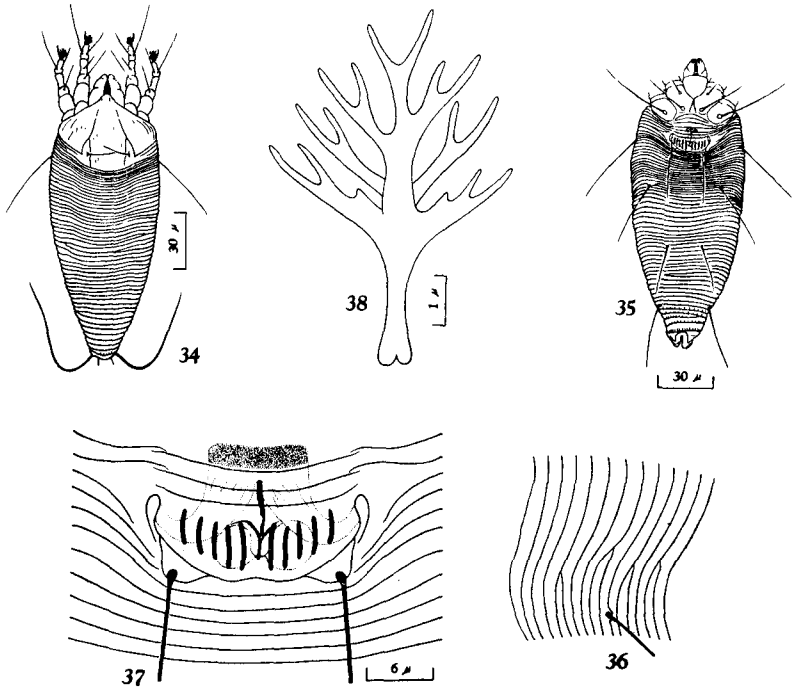
(6) ***Epitrimerus pyri*** **(Nalepa)**
(Figs. 34–38)

Tegonotus pyri Nalepa, 1891, Anz. Akad. Wiss. math.-nat. Wien. 28: 162.
Epitrimerus pirifoliae Keifer, 1938b, p. 309.
Epitrimerus pyri (Nalepa), Keifer, 1952b, p. 55.

Female. Deutogyne. Body flattened, light yellow in color. Rostrum down curved. Shield triangular, with an anterior lobe, but without prominent lobes on both sides as protogyne; ratio of width/length 1.3; dorsal tubercles 17.1–17.9μ apart, in front of the rear margin; dorsal setae 13.1–14.9μ long, directed upward. Abdomen not microtuberculated, with 48–50 tergites and 54–55 sternites; breadth of tergite 2.4μ, sternite 2.1μ. Relative lengths of segments of fore-leg: tibia$>$tarsus$>$claw$>$featherclaw; hind-leg, tibia$\geqq$claw$\geqq$tarsus; claw with slight knob, featherclaw 4-rayed. Genitalia 20.1–21.3μ wide, 9.4–10.4μ long; genital coverflap with 10 longitudinal ridges. Intervals "ds-ds & ts_3-gs", "cs-cs & ts_1-ts_1" and "acs-acs & ts_1-ts_2" are thoroughly in the same distance respectively; "ts_2-ts_2 & ts_2-ts_3" and "vs_3-vs_3 & ls-vs_1" are nearly in the same distance individually. Relative lengths of setae: cs$>$$ts_3$$\geqq$ls$>$$vs_1$$\geqq$$vs_3$$>gs\geqq$$vs_2$$\geqq$$ts_2$$>ds>$$ts_1$$>$acs. Setae gs on 4–6 sternites, ls on 9–10, vs_1 on 18–19, vs_2 on 32–33, vs_3 on 48–49. Ratio of length/interval between bases of pair ts_1=0.7, ts_2=3, ts_3=1.7, ds=0.7, ls=0.8, vs_1=1, vs_2=1.5, vs_3=1.6, acs=0.6, cs=5.8, gs=1.8. Average measurements in micra (n=5): body length 142.1, thickness 43.4, width 57; shield length 36.6, width 49; lengths: fore-leg, tibia 9.9, tarsus 9.3, claw 6.9, featherclaw 6.3; hind-leg, tibia 7.7, tarsus 7.5, claw 7.7; setae ts_1 7.5, $ts_2$25.1, ts_3 40.9, ds 14.2, ls 39.7, vs_1 36.3, vs_2 26.4, vs_3 35.9, acs 3.6, cs 58.4, gs 28.3; intervals of setae ds-ds 19.8, ts_1-ts_1 10.1, ts_2-ts_2 8.3, ts_3-ts_3 23.6, gs-gs 15.9, ls-ls 50.1, vs_1-vs_1 35.4, vs_2-vs_2 17.3, vs_3-vs_3 22.6, cs-cs 10.1, acs-acs 6.4, ts_1-ts_2 6.4, ts_2-ts_3 8.1, ts_3-gs 19.8, gs-ls 18.3, ls-vs_1 22.7, vs_1-vs_2 32.2, vs_2-vs_3 33.2, cs-acs 2.3.

Male. Not available to the writer.

Specimens examined. Specimens on *Pyrus serotina* var. *culta* Rehder (Rosaceae) at Koge, Yazu, Tottori Pref., Honshu, were collected on June 13, 1965 by K. Yoneyama (Chief of Tsunoi Station, Tottori Pomological Research Institute) and handed for identification to the writer.



Figs. 34–38. *Epitrimerus pyri*, deutogyne, ♀. 34, dorsum. 35, venter. 36, side skin structure (left). 37, genitalia. 38, featherclaw.

Distribution and hosts. Japan (first record), U.S.A. (Parrott et al., 1906; Keifer, 1938b, 1952b; Forsythe & Rings, 1966), Austria (Keifer, 1952b), Hungary (Henrik, 1966), Middle Europe (Nalepa, 1891); on pear.

Remarks. The mites were collected in summer and only deutogynes were observed. This comes to a point of agreement with Keifer's comment (1952b). The pear leaves become tinged with brown when they are injured with numerous mites. This mite is new to Japan.

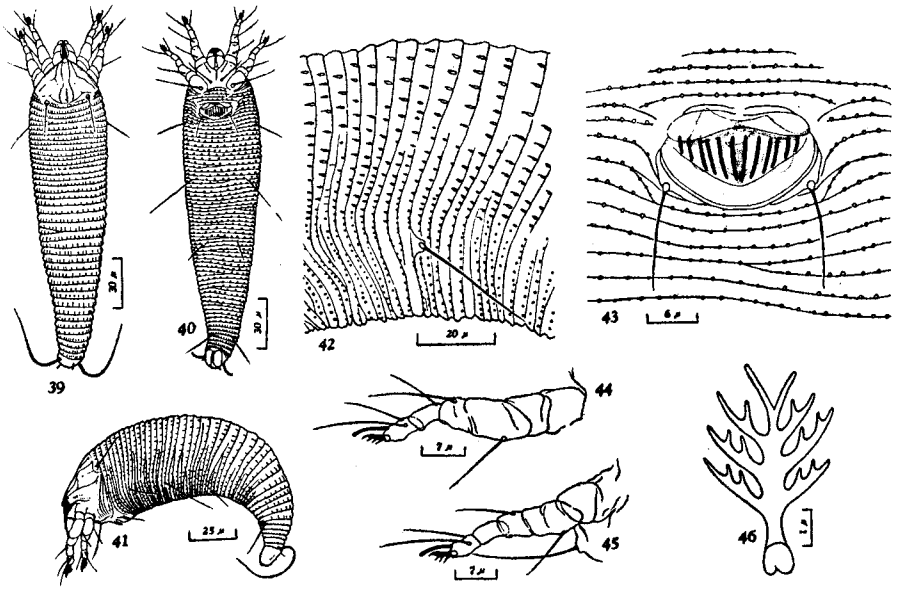
Aculops Keifer

Aculops Keifer, 1966, p. 9.

(7) *Aculops chinonei* n. sp.

(Figs. 39–46)

Female. Body curved spindleform, cylindrical, light yellow somewhat greenish in color. Rostrum curved downward. Shield resembling to triangular; ratio of width/length 1.4; median line present on rear one third, with a faint dart-shaped end; admedians complete, gently arching back from the front and recurving to about two thirds, then rearching to the rear edge, connecting with a sinuated line from front of dorsal tubercles at each side; submedians running latero-caudally, arching and recurving, but unclear on the frontal half; dorsal tubercles 19.8–22.4μ apart, on rear edge of shield; dorsal setae 19.8–22.3μ long, directing backward. Abdomen with rather elongate microtubercles on tergites, rounded one on sternites; with 31–44 tergites and 68–71 sternites; breadth of



Figs. 39–46. *Aculops chinonei* n. sp., ♀. 39, dorsum. 40, venter. 41, lateral aspect. 42, side skin structure (left). 43, genitalia. 44, left anterior leg. 45, left posterior leg. 46, featherclaw.

tergite 4.8μ, sternite 2.8μ. Relative lengths of segments of fore-leg: tibia>claw>tarsus≧featherclaw; hind-leg, claw>tarsus>tibia; claw slightly knobbed and gently curved, featherclaw 4-rayed. Genitalia 19.8–20.3μ wide, 12.2–12.6μ long; genital coverflap with 10–12 longitudinal furrows. Intervals "acs-acs & ts_2-ts_2" and "vs_1-vs_1 & ls-vs_1" are almost in the same distance separately; ts_1-ts_1 is longer only a few than ts_2-ts_2. Relative lengths of setae: cs>vs_1≧ts_3>vs_3≧ds≧ts_2≧ls

$>gs \geqq vs_2 > ts_1 > acs$. Setae gs on 7–8 sternites, ls on 12–13, vs_1 on 25–26, vs_2 on 41–43, vs_3 on 62–66. Ratio of length/interval between bases of pair $ts_1=1$, $ts_2=2.7$, $ts_3=1.7$, ds=0.8, ls=0.4, $vs_1=1$, $vs_2=0.7$, $vs_3=1.5$, acs=0.6, cs=4.9, gs=0.8. Average measurements in micra (n=5): body length 186.7, thickness 44.8, width 49.2; shield length 29.2, width 40.7; lengths: fore-leg, tibia 6.2, tarsus 5.4, claw 5.9, featherclaw 4.9; hind-leg, tibia 4.9, tarsus 5.4, claw 5.9; setae ts_1 7.6, ts_2 19.3, ts_3 29.9, ds 20.7, ls 18.4, vs_1 35.1, vs_2 12.4, vs_3 21.6, acs 3.8, cs 48.2, gs 13.2; intervals of setae ds-ds 24.7, ts_1-ts_1 7.9, ts_2-ts_2 7.2, ts_3-ts_3 17.7, gs-gs 15.6, ls-ls 45.2, vs_1-vs_1 33.8, vs_2-vs_2 18.6, vs_3-vs_3 14.5, cs-cs 9.9, acs-acs 6.9, ts_1-ts_2 5.5, ts_2-ts_3 6.4, ts_3-gs 19.3, gs-ls 17, ls-vs_1 34.1, vs_1-vs_2 39.4, vs_2-vs_3 56.3, cs-acs 2.5.

Male. Not available to the writer.

Specimens examined. Specimens on *Rhus javanica* Linn. (Anacardiaceae) were collected at Tsukuba, Ibaragi Pref., Honshu, on Aug. 17, 1968, by S. Chinone.

Distribution and hosts. Japan (Honshu), on Java sumac.

Remarks. Round cavities were found mainly on undersurfaces of the injured leaves, where the cavities were covered with greenish white villi. Under the influence of injury caused by mites, the leaves were distinctly malformed and hastened to fall. This species is named in honor of Mr. S. Chinone, who has been deeply interested in eriophyid mites and handed many specimens to the writer.

The species is similar in shield design to *Aculops rhoicecis* (K.) (Keifer, 1962b), but the submedian line connects to admedian line by side branch. It also has certain resemblances in female genitalia, shield network and body size to *Aculops alachuae* Keifer (Keifer, 1966), but it has not the anterior part of median line with the sharp, dart-shaped ending on rear margin, which is very distinct in the latter one. The tergites and sternites of this species are distinctly differentiated in numbers and breadth from *Aculops alachuae* and *Aculops rhoicecis*.

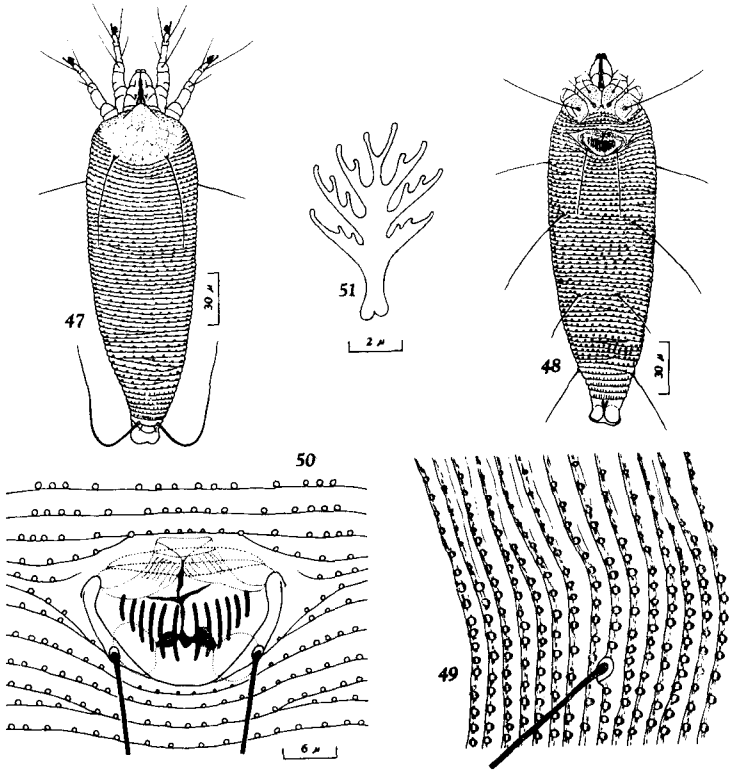
(8) ***Aculops niphocladae*** **Keifer**

(Figs. 47–51)

Aculops niphocladae Keifer, 1966, p. 19, pl. 10.

Female. Body wormlike-fusiform, orange colored (viz. reddish-yellow in color). Rostrum with antapical seta, obliquely curved down. Shield with a bluntly rounded short anterior lobe, designing rather narrow lines of granular and short dashes; median line present but so obscure on anterior one third part, crossed by two transverse lines at 1/3 from anterior and posterior respectively, a head of dart-shaped mark at posterior margin and symmetrically elongating anterio-laterally in connection with admedians; complete admedians setting out from anterior lobe to rear and forming three arcs outside-arched and bounded by cross lines; first submedians starting from anterior lobe running to rear somewhat parallel to admedians, but terminating at second cross line; two cross lines and longitudinal lines intersected mutually to build up a number of cells; both lateral sides with granules; ratio of shield width/length 1.3; dorsal tubercles 22.6–23.3μ

apart, on rear margin; dorsal setae 51.6–57μ long, projecting caudad. Abdomen with microtubercles, containing 63–65 tergites and 67–69 sternites; breadth of tergite 2.9μ, sternite 2.7μ. Relative lengths of segments of fore-leg: tibia>tarsus≧claw>featherclaw; hind-leg, claw≧tibia=tarsus; claw with slight terminal knob, featherclaw 4–rayed. Genitalia 22.3–23.6μ wide, 16.1–17.4μ long; genital coverflap with 12 longitudinal ribs. Intervals "ds-ds & ts_3-ts_3", "cs-cs & ts_2-ts_3" and "vs_1-vs_2 & vs_2-vs_3" are nearly in the same distance individually. Relative lengths of



Figs. 47–51. *Aculops niphocladae*, ♀. 47, dorsum. 48, venter. 49, side skin structure (right). 50, genitalia. 51, featherclaw.

setae: cs>vs_1≧ds≧ts_3>gs≧vs_3>vs_2≧ls>ts_2>ts_1>acs. Setae gs on 6–7 sternites, ls on 12–13, vs_1 on 26–28, vs_2 on 43–45, vs_3 on 61–63. Ratio of length/interval between bases of pair ts_1=0.6, ts_2=2.4, ts_3=1.9, ds=2.1, ls=0.6, vs_1=1.6, vs_2=1.6, vs_3=1.4, acs=0.7, cs=9.7, gs=2.3. Average measurements in micra (n=5): body length 196.6, thickness 52.2, width 57.3; shield length 35.8, width 47.3; lengths: fore-leg, tibia 10, tarsus 7.8, claw 7.5, featherclaw 6.3; hind-leg,

tibia 7.6, tarsus 7.6, claw 7.9; setae ts_1 7.3, ts_2 19.8, ts_3 49.7, ds 54.2, ls 30.8, vs_1 58.1, vs_2 31.8, vs_3 37.6, acs 4.4, cs 87.1, gs 37.9; intervals of setae ds-ds 26, ts_1-ts_1 12, ts_2-ts_2 8.1, ts_3-ts_3 25.8, gs-gs 16.5, ls-ls 55.2, vs_1-vs_1 35.5, vs_2-vs_2 19.7, vs_3-vs_3 26, cs-cs 8.9, acs-acs 6.1, ts_1-ts_2 7.6, ts_2-ts_3 9, ts_3-gs 24.9, gs-ls 21.5, ls-vs_1 37.4, vs_1-vs_2 46.4, vs_2-vs_3 47.5, cs-acs 2.2.

Male. Not available to the writer.

Specimens examined. Specimens on *Salix babylonica* Linn. (Salicaceae) at Mizukaido, Ibaragi Pref., Honshu, were collected on Oct. 13, 1968, by S. Chinone.

Distribution and hosts. Japan (first record), Canada (Keifer, 1966); on weeping willow.

Remarks. According to an information from the collector, the mites build up beady galls on the undersurface of leaves and keep minute openings on the opposite side of leaves. Villi at the openings and inside the galls are clearly recognized.

(9) ***Aculops pelekassi*** **(Keifer)**

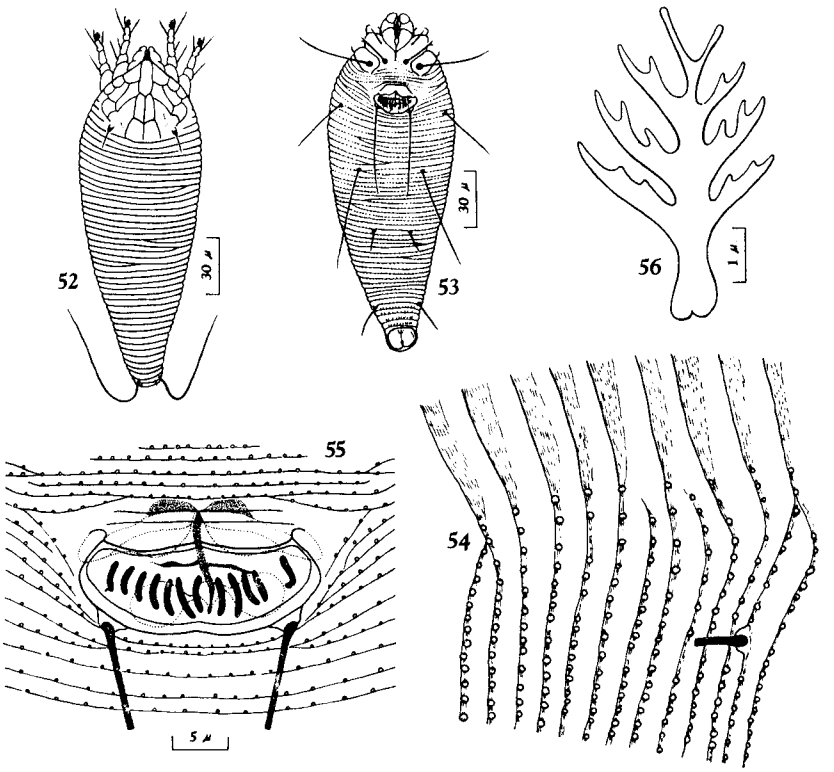
(Figs. 52–56)

Aculus pelekassi Keifer, 1959a, p. 6, pl. 5: 1959b, p. 5: 1962a, p. 11; Denmark, 1962, p. 25.

Aculops pelekassi (Keifer), Keifer, 1966, p. 9.

Female. Body spindleform, light yellow to yellowish white in color. Rostrum curved downward obliquely. Shield with anterior lobe; ratio of width/length 1.4; median line in wanting of more than one third part at the front, the apex as well as the midpoint of the line connected with admedians by two pairs of anterio-exteriorly running lines; admedians complete, starting from anterior lobe to rear, linking with median line at two points which dividing them into three sub-equal parts; clear lateral lines designing cells along the shield edge; dorsal tubercles 26.8–28.8μ apart, on rear margin; dorsal setae 8.7–9.9μ long, diverging backward. Abdomen with microtubercles on sternites only, consisting of 37–46 tergites and 52–58 sternites; breadth of tergite 3μ, sternite 2.3μ. Relative lengths of segments of fore-leg: tibia$\geqq$tarsus$>$claw$>$featherclaw; hind-leg, claw$\geqq$tarsus$\geqq$tibia; claw loosely curved and with a knob, featherclaw 4-rayed. Genitalia 21.1–22.6μ wide, 11.2–13.6μ long; genital coverflap with 12 irregular furrows which are either longitudinal or curved. Intervals "ds-ds & vs_1-vs_1" and "cs-cs & ts_2-ts_2" nearly in the same distance respectively; ts_1-ts_2 indistinctly longer than ts_2-ts_3. Relative lengths of setae: cs$>$$vs_1$$\geqq$gs$>$$ts_3$$>ls>$$vs_3$$>$$ts_2$$>$$vs_2$$\geqq$ds$\geqq$$ts_1$$>$acs. Setae gs on third sternite, ls on 6–7, vs_1 on 16–20, vs_2 on 31–35, vs_3 on 47–52. Ratio of length/interval between bases of pair ts_1=0.8, ts_2=1.7, ts_3=1.7, ds=0.3, ls=0.7, vs_1=1.8, vs_2=0.6, vs_3=1.3, acs=0.3, cs=6.6, gs=3. Average measurements in micra (n=5): body length 174.1, thickness 54.8, width 60.9; shield length 35.6, width 48.1; lengths: fore-leg, tibia 6.9, tarsus 6.8, claw 6.3, featherclaw 4.9; hind-leg, tibia 6.1, tarsus 6.2, claw 6.2; setae ts_1 9.5, ts_2 16.1, ts_3 39.4, ds 9.6, ls 33, vs_1

54.8, vs_2 10.4, vs_3 26.3, acs 2.3, cs 64.7, gs 45.6; intervals of setae ds-ds 30.5, ts_1-ts_1 12.4, ts_2-ts_2 9.4, ts_3-ts_3 23.1, gs-gs 15.1, ls-ls 49.6, vs_1-vs_1 30.9, vs_2-vs_2 16.7, vs_3-vs_3 21, cs-cs 9.8, acs-acs 7, ts_1-ts_2 8.4, ts_2-ts_3 7.4, ts_3-gs 22.6, gs-ls 16.9, ls-vs_1 31.3, vs_1-vs_2 32.8, vs_2-vs_3 39.2, cs-acs 2.1.



Figs. 52–56. *Aculops pelekassi*, ♀. 52, dorsum. 53, venter. 54, side skin structure (right). 55, genitalia. 56, featherclaw.

Male. Not available to the writer.

Specimens examined. Specimens on *Citrus Unshiu* Marcovitch (Rutaceae) were collected at different localities: Kihara, Mihara, Hiroshima Pref., Honshu, on Nov. 19, 1964, by K. Sadai; Terawura, Ogi, Saga Pref., Kyushu on Nov. 17, 1964 by M. Seki; Haraguchi, Oomura, Nagasaki Pref., Kyushu, on Nov. 27, 1964, by K. Hamaguchi & T. Oota; Kawachiyoshino, Hôtaku, Kumamoto Pref., Kyushu, on Dec. 12, 1964, by K. Nishida; Katsuwura, Katsuwura, Tokushima Pref., Shikoku, on Nov. 17, 1964, by M. Kagawa. Specimens were also collected on "Nankan" (*Citrus* sp.) at Mt. Kitashiro, Kohchi Pref., Shikoku, on Dec. 1, 1964, by

M. Kawamura; on "Natsu-Mikan" (*Citrus* sp.) at Tagami, Tarumizu, Kagoshima Pref., Kyushu, on Nov. 18, 1964, by I. Miyaseko and M. Kono.

Distribution and hosts. Japan (Honshu, by Keifer, 1962a; Kyushu & Shikoku, first record), Thailand (Keifer, 1959b), U.S.A. (Denmark, 1962 & 1966), Greece (Keifer, 1959a, 1959b & 1962a), Italy (Keifer, 1962a); on orange and mandarin.

Remarks. The mite is a very serious and common pest of citrus tree in Japan. The minute mites infest the surface of fruits, leaves and twigs, causing a rust-like discoloration, known as russeting. Previous to the present paper, Keifer (1962a) reported the species from Japan, based on the specimens from Okitsu, Shizuoka Pref., Honshu, which were handed through S. Ehara. The mites from Kyushu and Shikoku in Japan are hereby new local records.

Trisetacus **Keifer**

Trisetacus Keifer, 1952, p. 32.

(10) ***Trisetacus pini*** **(Nalepa)**

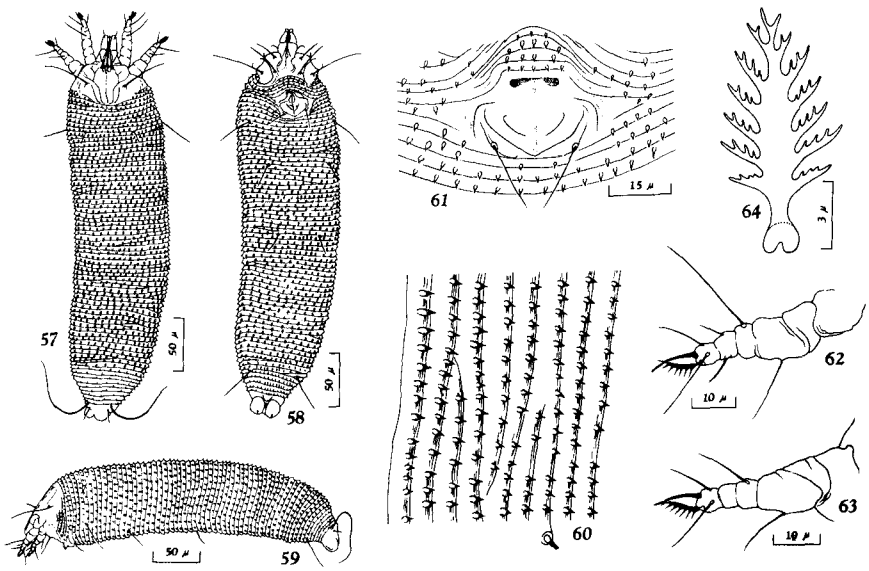
(Figs. 57–64)

Phytoptus pini Nalepa, 1887, Ab. Akad. Wiss. math.-nat. Wien. 96: 133.
Eriophyes pini (Nalepa) Keifer, 1938a, p. 182.
Trisetacus pini (Nalepa) Keifer, 1952b, p. 20, pl. 1–1; 1963, p. 2, pl. 1.

Female. Body of elongated cylindrical form, light yellow to yellowish white in color. Rostrum curved ventrally. Shield somewhat truncated anteriorly; ratio of width/length 1.5; five longitudinal lines rather gathering together at the rear of disk: median line present but the frontal half not clear; admedian and submedian lines all starting from the rear edge and diverging anteriorly, adjacently to tubercles; dorsal tubercles 29.3–32.7μ apart, approximately at the middle of disk; dorsal setae 37.7–49.6μ long, projecting forward; median anterior shield seta present, 8.7–9.9μ long. Abdomen with strongly spinulate microtubercles, 72–75 tergites and 69–72 sternites; breadth of tergite 4.8μ, sternite 5μ; a pair of subdorsal setae 41.1–44.6μ apart, 8.7–10.4μ long, keeping a little distance behind the shield. Relative lengths of segments of fore-leg: claw>featherclaw>tarsus$\geqq$tibia; hind-leg, claw>tarsus>tibia; claw curving and tapering, featherclaw 7-rayed. Genitalia 28.5–31μ wide, 18.6–19.8μ long; genital coverflap short, without a rib. Intervals ts_3-ts_3 and vs_3-vs_3 are nearly in the same distance; "ts_1-ts_1 & ts_2-ts_2" and "gs-gs & gs-ls" are only a few disparity in distance. Relative lengths of setae: cs>$ts_3$$\geqq$ds>$vs_3$$\geqq$ls=$ts_2$>$vs_1$$\geqq$$ts_1$>gs$\geqq$$vs_2$>acs$\geqq$sds[1]$\geqq$fss[2]. Setae sds on 9–10 tergites; gs on 6–7 sternites, ls on 10–11, vs_1 on 18–21, vs_2 on 34–37, vs_3 on 63–66. Ratio of length/interval between bases of pair ts_1=1.2, ts_2=1.9, ts_3=1.4, ds=1.2, sds=0.2, ls=0.5, vs_1=0.4, vs_2=0.5, vs_3=0.9, acs=0.7, cs=3.1, gs=0.7. Average

1) sds....subdorsal setae.
2) fss....frontal (or anterior) shield seta.

measurements in micra (n=5): body length 338.5, thickness 76.8, width 76.7; shield length 42.4, width 64.9; lengths: fore-leg, tibia 5.2, tarsus 5.9, claw 10.1, feather-claw 9.5; hind-leg, tibia 4.6, tarsus 5.6, claw 9.6; setae ts_1 21.4, ts_2 33.1, ts_3 49.6, ass 9.4, ds 43.7, sds 9.7, ls 33.1, vs_1 22, vs_2 16.5, vs_3 34, acs 11.3, cs 66.9, gs 16.9; intervals of setae ds-ds 35.5, sds-sds 43.3, ts_1-ts_1 18.5, ts_2-ts_2 17.8, ts_3-ts_3 36.3, gs-gs 24.4, ls-ls 69.6, vs_1-vs_1, 54.1, vs_2-vs_2 32.2, vs_3-vs_3 36.4, cs-cs 21.6, acs-acs 16.7, ts_1-ts_2 12, ts_2-ts_3 9.7, ts_3-gs 33.6, gs-ls 23.7, ls-vs_1 41.7, vs_1-vs_2 76.8, vs_2-vs_3 136.4, cs-acs 4.1.



Figs. 57–64. *Trisetacus pini*, ♀. 57, dorsum. 58, venter. 59, lateral aspect. 60, side skin structure (left). 61, genitalia. 62, left anterior leg. 63, left posterior leg. 64, featherclaw.

Male. Not available to the writer.

Specimens examined. Specimens on *Larix leptolepis* Murray (Pinaceae) were collected at Komoro, Nagano Pref., Honshu, on Sept. 16, 1965, by M. Hagihara; on Sept. 29, 1965, by Y. Momose: on *Larix europae* Dc. at Komoro, Nagano Pref., Honshu, on Sept. 16, 1965 by M. Hagihara.

Distribution and hosts. Japan (first record), on Japanese and European larches; U.S.A. (Keifer, 1938a, 1952b) on pine; Europe (Nalepa, 1887) on pine.

Remarks. The mite is a very destructive pest to the larch trees in Japan. According to the survey of the Kanto Forests Breeding Station (Momose, 1964), the damage of buds caused by the mites was as high as 61%. The mites inhabited the buds in a colony. Commonly a concentrated population more than scores to hundred could be found out from a bud. An infested bud was evidently more

inflated early than a normal bud, then withered as soon as the contents were consumed out. The abnormal branching and bending of twigs could be significantly observed in the case in which the top buds of twigs were damaged by the mites. This mite is the largest one among the ten species here studied. The mite is new to Japan.

Summary

Ten species of phytoparasitic mites of the superfamily Eriophyoidea from Honshu, Kyushu and Shikoku in Japan are described in the present paper. Among them, nine species belong to the family Eriophyidae and one to Phytoptidae. Two species, *Aceria japonica* and *Aculops chinonei* are described as new to science. The remained eight species, *Aceria macrodonis* Keifer, *Aceria paradianthi* Keifer, *Calacarus carinatus* (Green), *Phyllocoptes carilubi* Keifer, *Epitrimerus pyri* (Nalepa), *Aculops niphocladae* Keifer, *Aculops pelekassi* (Keifer) and *Trisetacus pini* (Nalepa) are redescribed and figured in detail, and are new to Japan except for *Aculops pelekassi* (Keifer) which has been reported from Shizuoka, Honshu (Keifer, 1962a), and *Calacarus carinatus* (Green) which has been listed from Uji, Kyoto, Honshu (Minamikawa, 1955) previously.

The writer wishes to express his hearty thanks to Prof. M. Yamada for his invaluable suggestions and kind reviewal of the manuscript. He is also grateful to Prof. S. Ehara of Tottori University for his past guidance on acarology. Further, acknowledgement is made to Mr. S. Chinone of Mizukaido Second High School, for his kindness in placing the present materials. The writer is also indebted to the several collectors named in the text.

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