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Some Spider Mites from Northern Japan^{1),2)}

By

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(With 22 Text-figures)

Among the spider mites (Tetranychidae) here treated, one is new to science, another one new to Japan, and four species, though already recorded from this country, have been redescribed, because the previous descriptions on them seem to be insufficient.

Before going further, the author would like to express his gratitude to Professor Tohru Uchida for his helpful guidance. The author is also grateful to Prof. E. Sawada, Dr. S. Kuwayama, Dr. M. Inouye, Mr. J. Kimura, Dr. K. Asanuma, Dr. S. Hukusima, Mr. Y. Nishio and Mr. H. Takahashi, who all kindly helped the work in various ways.

***Bryobia praetiosa* Koch**

(Figs. 1-2).

Bryobia praetiosa Koch, Deuts. Crust. Myr. Arachn., fasc. 1, t. 8, 1836; Asanuma, Illustr. Encycl. Fauna Jap., p. 958, fig. 2725, 1947; Pritchard & Baker, Hilgardia, 21: 259, pl. 1, 1952; ———, Rev. Spider Mite Fam. Tetranych., p. 26, figs. 19, 20, 1955; Nishio & Imabayashi, Ann. Rep. Agr. Pest Res. Soc. North Jap., 1953 (no. 4), p. 147, 1953; Nishio, Ôyô-Kontyû, 10: 29, figs, 1954; ———, Hokunô, 21: 376, 1954; Ehara, Zool. Mag., 63: 476, 1954; Tsugawa, Agric. & Horticult., 30: 244, 1955.

Bryobia speciosa Koch, Deuts. Crust. Myr. Arachn., fasc. 17, t. 10, 1938.

Bryobia pratensis H. Garman, 14th Rept. State Ent. Illinois, p. 73, pl. 6, 1885.

Bryobia pratensis (partim), Nakayama, Apple Cult. & Pests (Jap.), p. 308, 1943; Fukuda, Control Fruit Tree Ins. Pests, p. 329, 1951.

Female. Body from above oval, somewhat depressed dorsally, truncate caudally in profile; measuring 650 to 810 μ long (750 μ in average) and 500 to 640 μ wide in widest part (560 μ in average). Colour reddish to dark brown, often with a greenish tinge. The anterior margin of cephalothorax bears a four-lobed projection, each lobe being provided terminally with a fan-like seta. Distal segment of palpus subcylindrical but slightly truncate obliquely, with 7 additional setae and without terminal and dorsal sensilla; penultimate segment of palpus bearing dorsally a stout, sharply curved claw at the apex. Mandibular plate emarginate mediodistally. The ratio of length to breadth of the plate is variable in locality, 10:8 in the specimens from Hokkaido and Aomori Pref., while 10:

1) Contribution No.345 from the Zoological Institute, Faculty of Science, Hokkaido University, Sapporo, Japan.

2) Aided by a grant from the Scientific Research Fund of the Hokkaido Prefectural Office. Jour. Fac. Sci. Hokkaido Univ. Ser. VI, Zool. 12, 1956.

6.7 in those from Shizuoka Pref. Leg I as long as, or longer than body, other legs shorter than body as usual. Generally, the setae of legs are rough and short in proximal half, while slender and longer in distal half. Tarsi furnished with 2 strong claws which bear knobbed hairs laterally. The relative lengths of segments of leg I are variable in locality, as shown in Table 1. Tibia I characteristically

Table 1. The relative lengths of segments of leg I of *Bryobia praetiosa*

Segment	Coxa	Trochanter	Femur	Patella	Tibia	Tarsus (claws exclusive)
Specimens from Hokkaido and Aomori Pref.	—	5	23	6.5	16.5	11
Specimens from Shizuoka Pref.	—	5	23	9	16.5	11

narrow in width generally. Tarsus I dorsally provided with 2 conspicuously long setae which are proximate. Empodia II-IV with two rows of tenent hairs. Two eyes present on each side. Peritreme slender in the proximal part, and much expanded in the rest which opens externally on each lateral side of mandibular plate. Dorsum of body coarsely wrinkled. Dorsal setae of body proper short and fan-like, 28 in number.

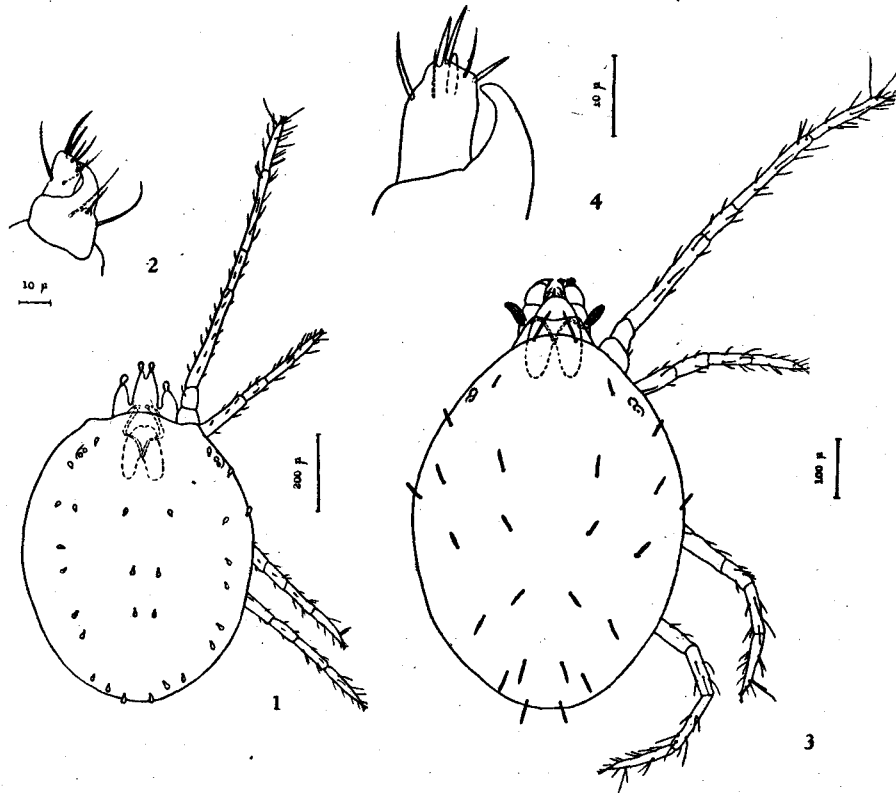
Male. Unknown.

Specimens examined. Hokkaido: University Farm, Sapporo, 1 ♀ (on grass), 12. VI, 1954, 2 ♀ ♀ (on grass), 21. VI, 1954, 1 ♀ (on apple), 22. VI, 1954, 1 ♀ (on strawberry), 17. VII, 1954, S. Ehara leg.; Maruyama, Sapporo, 1 ♀ (on clover), 10. VI, 1954, S. Ehara leg.; Sôen, Sapporo, 1 ♀ (in house), 30. VI, 1954, C. Oguro leg.; Kotoni, Sapporo, 2 ♀ ♀ (on "*Campanula medium*"), 16. VII, 1954, S. Ehara leg.; Hakodate, 1 ♀ (on iris), 21. VIII, 1954, S. Ehara leg. Honshu: Kuroishi, Aomori Pref., 10 ♀ ♀ (on clover under apple tree), 25. VIII, 1954, S. Ehara leg.; Okitsu, Shizuoka Pref., 14 ♀ ♀ (on pear bark), 14. II, 1952, S. Okudai leg.

Hosts. *Bryobia praetiosa* is known to occur in many kinds of plants, including several deciduous fruit trees. But it is probable that some of them are hardly injured.

Distribution. Japan (Hokkaido and Honshu); Australia, Europe, New Zealand, North Africa, North America, South Africa, South America and Turkey. In Japan, up to date, the mite has been recorded from northern parts only. Shizuoka Pref. (middle Japan) is a new locality.

Remarks. So far as the author studied, the specimens of Shizuoka Pref. (middle Japan) are slightly different from those of Hokkaido and Aomori Pref. (northern Japan) in the relative lengths of segments of leg I, and in the ratio of length to breadth of mandibular plate. As is partly shown in the synonymic references *Bryobia praetiosa* has fair number of synonyms. The biology of this mite was mainly made clear by efforts of Summers (1950a, 1950b), Summers & G. A. Baker (1952), and other workers.



Figs. 1-2. *Bryobia praetiosa*.
 1. Dorsal view of female. 2. Distal part of palpus of female.
 Figs. 3-4. *Petrobia latens*.
 3. Dorsal view of female. 4. Distal part of palpus of female.

***Petrobia latens* (Müller)**

(Figs. 3-4)

Acarus latens Müller, Zool. Dan. Prodr., p. 287, 1776.

Trombidium lapidum Hammer, in: Hermann Mém. Apt., p. 49, 1804.

Petrobia lapidum, Murray, Econ. Ent., Apt., p. 118, 1877.

Petrobia latens, Oudemans, Arch. Naturg., 81(A,5): 44, 1915; Baker & Pritchard, Hilgardia, 22: 206, figs. 2, 3, 1953; Pritchard & Baker, Rev. Spider Mite Fam. Tetr., p. 51, figs. 37, 38, 1955.

Female. Body from above oval, convex dorsally, 630 μ long in average and 450 μ wide in average in widest part. Colour dark to greenish brown. Distal segment of palpus subcylindrical, with 7 additional setae on the distal part, one of

them thick and spindle-shaped; terminal and dorsal sensilla not differentiated. Mandibular plate (ratio of length to breadth, 10 : 7) generally rounded in front. Leg I as long as, or longer than body, other legs shorter than body as usual. The setae on legs are short and rough in proximal half, while those are longer and slender in distal half. Relative lengths of segments in leg I as follows: Trochanter, 4; femur, 18; patella, 6; tibia, 14; tarsus (claw exclusive), 12. Generally, tibia I characteristically narrow in width. Tarsus I dorsotermally with 2 proximate sets of duplex setae, abruptly truncate in profile from the position of duplex setae to onychium; longer seta of a set of the duplex setae as long as those of other set. Empodium being of a single claw with two series of ventrally directed, knobbed hairs; 4 tenent hairs borne on onychium. One perfect and one imperfect eye present on each side. Peritreme slender in the proximal part, and much expanded in the rest, of a horn-like shape, which opens externally. Dorsum of body generally with transverse integumentary striae between the inner sacral and inner lumbar setae. Dorsal setae 26 in number, not set on tubercles, pubescent, blunted at the end, and much shorter than intervals to bases of setae next behind.

Male. Unknown.

Specimens examined. University Farm, Sapporo, 29 ♀♀ (on grass or on piece of wood), 16. VII, 1954, 1 ♀ (on the stone leek, *Allium* sp.), 17. VII, 1954, 1 ♀ (on strawberry), 17. VII, 1954, S. Ehara leg.

Hosts. According to Baker and Pritchard (1953), and Pritchard and Baker (1955), *Petrobia latens* is particularly a pest of low-growing monocotyledonous plants. Moreover, some other plants including cotton have been also reported as hosts. As shown above, this mite was found by the author in Japan on grass, strawberry and stone leek.

Distribution. Japan (Hokkaido); Australia, Europe, North Africa, and North America.

Remarks. *Petrobia latens* is new to Japan and is probably newly recorded from Asia. The biology of this mite was investigated by Fenton (1951) in North America.

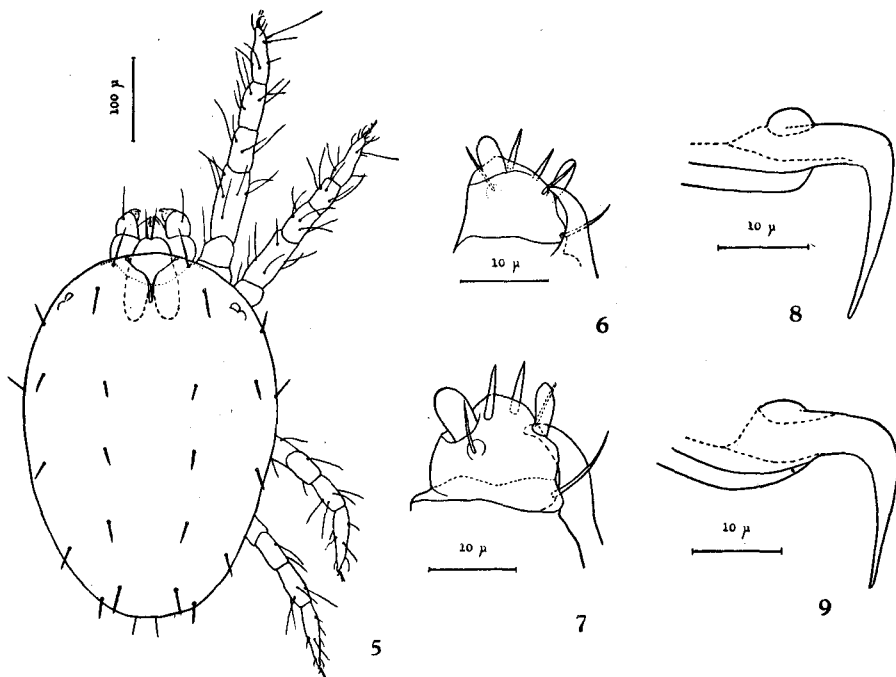
***Paratetranychus karamatus*¹⁾ n. sp.**

(Figs. 5-10)

Female. Body from above oval, 430 μ long in average and 310 μ wide in average in widest part. Colour reddish-brown. Distal segment of palpus broader than long; terminal sensillum about twice as long as broad; dorsal sensillum stout, spindle-shaped, about as long as terminal sensillum; 5 additional setae borne on "thumb," about as usual. Mandibular plate (ratio of length to breadth, 10 : 6), incised mediodistally. Legs shorter than body, with rather short setae. Relative

1) The new species is named after "karamatsu" which means the larch in Japanese.

lengths of segments in leg I as follows: Trochanter, 13; femur, 31; patella, 16; tibia, 17; tarsus (empodial claw exclusive), 23. Tarsus I dorsally provided with 2 sets of duplex setae closely set; 4 setae borne proximad of proximal set of duplex setae; proximal duplex setae of tarsus I with proximal member about two-fifths as long as distal member; distal duplex setae of tarsus I with proximal member about one-sixth as long as distal member. Empodial claw of leg I slender, sickle-shaped, with 5 pairs of proximoventral setae that do not exceed claw; 4 tenent hairs borne on onychium in two pairs, each present on a side of claw base, each



Figs. 5-9. *Paratetranychus haramatus* n. sp.

5. Dorsal view of female. 6. Distal part of palpus of male. 7. Distal part of palpus of female. 8 & 9. Aedeagus.

hair under twice as long as the claw. One perfect and one imperfect eye present on each side. Peritreme slender, terminated in oval chamber. Dorsum of body with striae mostly transverse. Dorsal setae distinctly shorter than intervals to bases of setae next behind, with an exception of vertical setae which are generally longest. They not arising from tubercles, tapering and pubescent.

Male. Body from above sagittate in outline, 280 μ long and 200 μ wide in widest part. Accessories on distal segment of palpus are subequal in structure

and arrangement to those in female. All dorsal setae comparatively long. The aedeagus is rather of type of *Paratetranychus yothersi* (McGregor) from North America (McGregor, 1914, '50). Inner lobe convex posteroventrally; the basilar lobe is conspicuously observable dorsally; shaft slightly tapering posteriorly and deflected a little less than 90° from its axis to form the hook which is much longer than the shaft and is tapering to a thin, unbarbed tip.

Holotype. ♂, 28. VIII, 1953, Nanaé, in the vicinity of Hakodate, S. Ehara & H. Takahashi leg.

Allotype. ♀, 20. VIII, 1954, Nanaé, S. Ehara leg.

Paratypes. 9♂♂ & 31♀♀, 28. VIII, 1953, Nanaé, S. Ehara & H. Takahashi leg., 10♀♀, 20. VIII, 1954, Nanaé, S. Ehara leg.; 1♀, 21. VII, 1954, 4♂♂ & 6♀♀, 14. VIII, 1954, Shindô-guchi near Otaru, S. Ehara leg.; 3♂♂ & 5♀♀, 9. IX, 1954, Tôma-mura, Prov. Kamikawa, M. Inouye leg.; 4♂♂ & 15♀♀, 25. VIII, 1954, Hirosaki, Aomori Pref., S. Ehara leg.

The types are deposited in the Zoological Institute, Faculty of Science, Hokkaido University.

Host. *Paratetranychus karamatus* n. sp. was always collected on the larch, *Larix leptolepis*.

Distribution. Japan (Hokkaido and Honshu).

Remarks. *Paratetranychus karamatus* n. sp. is closely related to *P. brevipilosus* Zacher, 1932, of Europe, but is characterized in the vertical setae which are longer than intervals to bases of setae next behind. Furthermore, the new species is distinct from the latter in the empodial claw which is over half of tenent hairs borne on onychium and exceeds the setae arising from its proximoventral portion. The new species also resembles *P. hondcensis* Ehara, 1954, of this country, but is different in the chaetotaxy of dorsum of body of female and in the structure of aedeagus (Ehara, '54a).

Tetranychus telarius (Linné)

(Figs. 11-15)

Acarus telarius Linné, Syst. Nat., Ed. 10, p. 616, 1758.

Tetranychus urticae Koch, Deuts. Crust. Myr. Arachn., fasc. 1, t. 10, 1835; Geijskes, Meded. Landb. Hooges. Wageningen, 42:36, Fig. 25, 1939; Ehara, Zool. Mag., 63:82, 1954.

Tetranychus telarius, Dugés, Ann. Sci. Nat. Paris (sér. 2), 1:15, 1834; Hirst, Ann. Mag. Nat. Hist., 9:621, 1924; Nishio, Ôyô-Kontyû, 10:31, figs., 1954; ———, Hokunô,



Figs. 10. Photomicrograph of empodial claw of leg I of *Paratetranychus karamatus* n. sp., showing that the claw is provided with 5 proximoventral setae on each side (Photo by Mr. H. Nakanishi). ×2700

- 21 : 376, 1954 ; Ehara, Zool. Mag., 63 : 476, 1954 ; Pritchard & Baker, Rev. Spider Mite Fam. Tetr., p. 432, figs. 386-391, pl. 1, 1955.
- Tetranychus bimaculatus* Harvey, Ann. Rep. Maine Agr. Exp. Sta., 1892, p. 133, 1893 ; McGregor, Amer. Midl. Nat., 44 : 281, pl. 7, 1950 ; Pritchard & Baker, Hilgardia, 21 : 268, pls. 12-15, 1952 ; Baker & Pritchard, Ibid., 22 : 221, figs. 16-18, pl. 1, 1953 ; Nishio & Imabayashi, Ann. Rep. Agr. Pest. Res. Soc. North Jap., 1953 (no. 4), p. 147, 1953 ; Tsugawa, Agric. & Hortic., 30 : 244, 1955.
- Tetranychus linteetarius*(!), Yago, Control Method Agr. Ins. Pests, p. 375, 1935 ; Ishii, Textb. Agr. Ent., p. 345, 1949.
- ? *Tetranychus bimaculatus* ?, Yago & Furukori, J. Plant Protect., 25 : 915, pl. (figs. 1-3), 1938.
- ? *Tetranychus biwaculatus* (!) ?, Yago, Ishii's "Control Method Hortic. Pests," Control of Spider Mites of Pear, p. 171, 1938.
- Tetranychus bimaculatus* (partim), Takeuchi & Oda, Guide Agr. Pests (Jap.), p. 286, 1940.
- Tetranychus linteetarius*(!), Y. Takahashi, Pract. Control Agr. Ins. Pests, p. 227, 1948 ; Kawamura & Y. Takahashi, Control Flowering Plant Pests, p. 219, 1950.
- ? *Tetranychus telarius*, Nakano & Hanaoka, Ann. Rep. Agr. Pest Res. Soc. North Jap., 1953 (no. 4), p. 153, 1953.

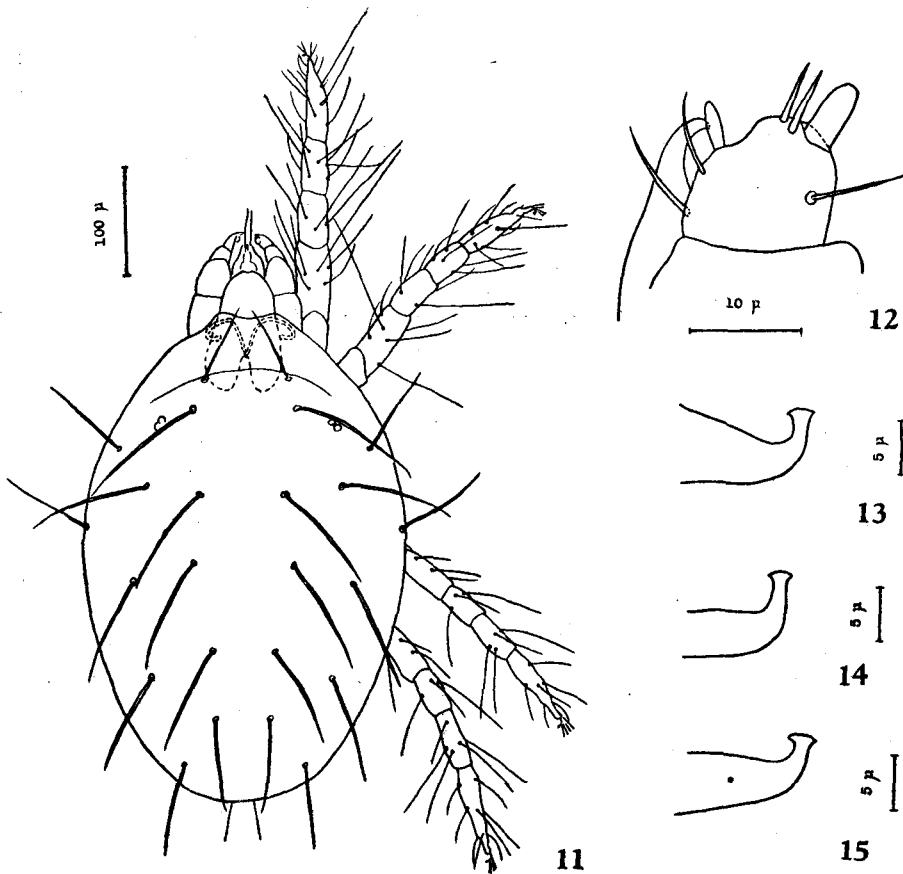
Female. Body oval from above, 390 to 560 μ long and 250 to 390 μ wide in widest part. Variable in colour ; greenish yellow or red, in the former a dark spot present on each side of the body. Distal segment of palpus about as long as broad ; terminal sensillum about twice as long as broad ; dorsal sensillum spindle-shaped, shorter than terminal one ; 5 additional setae present on "thumb" as usual. Mandibular plate (ratio of length to breadth, 10 : 6.5) slightly notched in front. Legs rather narrow, shorter than body, bearing many long setae. Relative lengths of segments in leg I as follows : Trochanter, 16 ; femur, 33 ; patella, 19 ; tibia, 20 ; tarsus (empodium exclusive), 31. Tarsus I dorsally furnished with 2 widely separated sets of duplex setae ; 4 setae borne proximad of proximal set of duplex setae ; proximal duplex setae of tarsus I with proximal member about one-sixth as long as distal member ; distal duplex setae of tarsus I with proximal member one-sixth to one-eighth as long as distal member. Empodium composed of 6 paired hairs as usual ; 4 tenent hairs normally arising from onychium. One perfect and one imperfect eye present on each side. Peritreme moderate in breadth, U-shaped in distal part. The integumentary striae longitudinally run between the inner sacral and inner lumbar setae, and a diamond-shaped figure is observable between these setae. Dorsal setae not arising from tubercles, slender, tapering, finely pubescent, and much longer than intervals to bases of setae next behind.

Eggs spherical, pale yellow in colour.

Male. Body from above sagittate in outline, 280 to 350 μ long and 180 to 220 μ wide in widest part. Accessories on distal segment of palpus are subequal in arrangement and structure to those in female. Empodium I stouter and shorter than in female, split into 6 divisions, and provided dorsally with a rather strong spur. When observed in lower magnification, on account of this spur, the empodium looks like a bifurcated claw. Aedeagus dorsally with basilar lobe which

is obscurely observable. Shaft narrowing posteriorly, directed upward about perpendicularly to form the hook which is provided with a small barb at the tip, the anterior and posterior projections being very small.

Specimens examined. A great number of specimens from Hokkaido, Aomori Pref., and Yamagata Pref. were studied. Specimens from middle Japan (Nagano Pref.) were also examined.



Figs. 11-15. *Tetranychus telarius*.

11. Dorsal view of female. 12. Distal part of palpus of female. 13-15. Aedeagus.

Hosts. The present species is well known to show an extremely wide range in host selection; there have been recorded many host plants of this species, including fruit trees, vegetables, flowering plants and other useful plants, and

including weeds and other non-economic plants. The present author also recognized the following various plants as hosts: Cucumber, soy bean, grape, hop, egg-plant, asparagus bean, strawberry, trefoil (*Cryptotaenia canadensis*), beefsteak plant (*Perilla frutescens* var. *crispa*); clover, dandelion, goose-foot; Rodger's bronze-leaf (*Rodgersia podophylla*), hydrangea, pansy, dahlia, China aster; apple, peach, plum; elder, maple, rowan (*Sorbus* sp.), pseudacacia, mulberry, platanus, Japanese snowflower (*Weigela hortensis* var.), dogwood (*Cornus* sp.), golden-ball tree (*Forsythia suspensa*), wild grape.

Distribution. Specimens from Hokkaido and Honshu have been available for the present study. The mite is widespread throughout most of the world.

Remarks. The present mite is well known in Japan, though often being confused in scientific name. The species is very common in northern Japan, and probably occurs commonly in other areas of this country. The biology of the species has been well studied by many authors. Recent knowledge of the seasonal phases and colour forms of the species are well summarized by Pritchard and Baker (1952, '55), and also Baker and Pritchard (1953).

***Amphitetranychus viennensis* (Zacher)**

(Figs. 16-19)

Tetranychus (*Epitetranychus*) *viennensis* Zacher, Privatdruck, datiert 17, Mai, 1920;

———, *Z. angew. Ent.*, 7: 186, Abb. 11-16, 1920.

Tetranychus crataegi Hirst, *Proc. Zool. Soc. Lond.*, 1920: 51, figs. 1g, 3a & 4a, July, 1920.

Amphitetranychus viennensis, Oudemans, *Ent. Ber.*, 8: 224, 1931; Geijskes, *Meded. Landb.*

Hoogesch. Wageningen, 42: 41, Fig. 37, 1939; Ehara, *Zool. Mag.*, 63: 476, 1954.

Tetranychus viennensis, Pritchard & Baker, *Rev. Spider Mite Fam. Tetran.*, p. 384, figs. 335, 336, 1955.

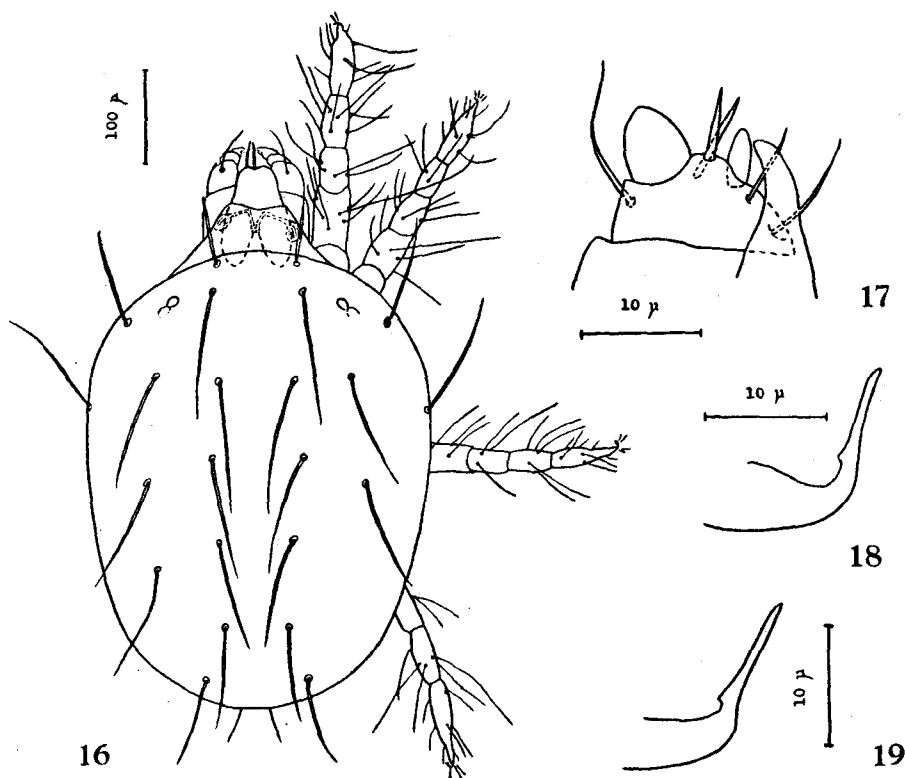
Tetranychus pacificus (nec McGregor), Nishio & Imabayashi, *Ann. Rep. Agr. Pest Res. Soc.*

North Jap., 1953 (no. 4), p. 147, 1953; Nishio, *Öyō-Kontyū*, 10: 31, figs., 1954;

———, *Hokunō*, 21: 376, 1954; Tsugawa, *Agric. & Horticult.*, 30: 244, 1955.

Female. Body from above elliptical, 510 μ long in average and 360 μ wide in average in widest part. Colour red in active stage except whitish legs, but bright carmine during hibernation. Distal segment of palpus much wider than long; terminal sensillum stout, about as long as wide, conical in shape; dorsal sensillum well developed; 5 additional setae present as usual. Mandibular plate (ratio of length to breadth, 10:7) slightly emarginate in front. Legs shorter than body, comparatively robust. Relative lengths of segments in leg I as follows: Trochanter, 17; femur, 33; patella, 19; tibia, 21; tarsus (empodium exclusive), 30. Tarsus I dorsally provided with much separated sets of duplex setae; 4 setae borne proximad of proximal set of duplex setae; proximal duplex setae of tarsus I with proximal member about one-seventh as long as distal member; distal duplex setae of tarsus I with proximal member one-eighth to one-ninth as long as distal member. Empodium consisting of 3 pairs of hairs; 4 tenent hairs normally set on onychium. One perfect and one imperfect eye present

on each side, the latter eye frequently seems to be absent. Peritreme moderate in breadth; complex and anastomosed distally, consequently the distal portion seems to be a maze. Dorsum of body with mostly transverse striae, and with parallel transverse ones not only between the inner sacral and inner lumbar setae, but also in the area between these setae. Dorsal setae not arising from tubercles, well developed, tapering, and much longer than intervals between them.



Figs. 16-19. *Amphitetranychus viennensis*.

16. Dorsal view of female. 17 Distal part of palpus of female. 18-19. Aedeagus.

Eggs spherical, pale yellow in colour.

Male. Body from above sagittate in outline, $360\ \mu$ long in average and $250\ \mu$ wide in average in widest part. Accessories on distal segment of palpus are subequal in arrangement to those in female; terminal sensillum conical as well as in female but distinctly shorter than dorsal sensillum. Empodium I with divisions shorter and stouter than in female, the middle division on each side stouter than

other two divisions. The aedeagus is as in figs. 18–19: Basilar lobe dorsal, shaft posteriorly tapering and bending upward to form the hook which is shorter than the shaft; hook gradually acuminate to a blunt tip, with a small process proximo-internally.

Specimens examined. Hokkaido: Kotoni, Sapporo, 20 ♀♀ (on sweet cherry), 5. VI, 1952, 5 ♂♂ & 10 ♀♀ (on sweet cherry), 16. VIII, 1954, S. Ehara leg.; Shindô-guchi near Otaru, 3 ♂♂ & 10 ♀♀ (on sour cherry), 14. VIII, 1954, S. Ehara leg. Honshu: Ishikawa, Aomori Pref., 7 ♀♀ (on apple), 11. VIII, 1953, K. Akino leg.; Shimizu-mura Strain (original locality, Shimizu-mura, Aomori Pref.; bred in Aomori Prefect. Apple Expt. Sta. at Kuroishi; natural and experimental hosts, apple), 5 ♂♂ & 15 ♀♀, 25. VIII, 1954; Kuniyoshi, Higashi-meya-mura, Aomori Pref., 10 ♀♀ (on apple), 9. X, 1953, S. Hukusima leg.; Mikka-machi, Yamagata, Yamagata Pref., 1 ♂ & 5 ♀♀ (on sweet cherry), 19. XI, 1953, I. Hanaoka leg.; Nishifukuro, Sukagawa, Fukushima Pref., 15 ♀♀ (on pear bark), 15. I, 1955, K. Endo leg.

Hosts. According to Zacher (1921) and Geijskes (1939), *Amphitetranychus viennensis* is injurious to apple, pear, cherry and hawthorn in Europe. Also in Japan, cherry, apple, pear, etc. are infested with the mite.

Distribution. Japan (Hokkaido and Honshu) and Europe.

Remarks. From Japan (Hokkaido) the present mite was first described by Nishio and Imabayashi (1953) and Nishio (1954) under the name *Tetranychus pacificus* McGregor. The author (1954b), however, recording the mite from Honshu, confirmed that it is not *T. pacificus* of U. S. A. and Canada but the present species of Europe. Tsugawa (1955) following Nishio and Imabayashi described as *T. pacificus* for the mite. The Pacific spider mite, *Tetranychus pacificus* McGregor, has never been collected or received from Japan by the present author.

The genus *Amphitetranychus* was created by Oudemans (1931), based on *T. viennensis* Zacher, the species here treated. Except the structure of peritreme, there cannot be hardly found valid characters distinguishing *Amphitetranychus* from *Tetranychus*. In the present state, however, the author prefers to use the genus name *Amphitetranychus*, concurring with most of recent authors.

The biology of the mite was recently studied by the Japanese authors (Nishio, 1954, Tsugawa, 1955). After Nishio whose observation was made in Sapporo, Hokkaido, the mite overwinters in the adult stage. The overwintering mites hide forming colonies under the bark of host trees, and appear in the next year on the leaves of host from the end of May to the beginning of June and lay eggs. Moreover, it was also proved that they have four or five generations during the summer and autumn. The results of Tsugawa whose observation was made at Kuroishi, Aomori Pref., are generally in accordance with Nishio's study, but are different in the fact that the overwintering females begin to become active even early in May and that the mite has one generation more.

***Metatetranychus ulmi* (Koch)**

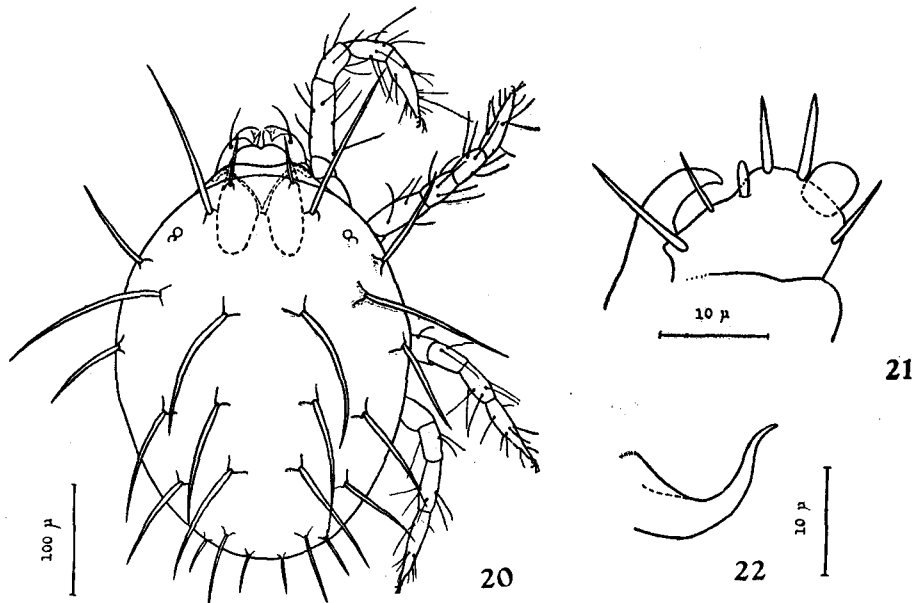
(Figs. 20-22)

- Tetranychus ulmi* Koch, Deuts. Crust. Myr. Arachn., fasc. 1, t. 11, 1836.
- Tetranychus pilosus* Canestrini & Fanzago, Atti Soc. Ven. Trent., 5 : 133, 1876.
- Paratetranychus pilosus*, Zacher, Berlin Mitt. biol. Anst., 14 : 38, 1913 ; Yago & Furukori, J. Plant Protect., 24 : 842, 1937 ; McGregor, Amer. Midl. Nat., 44 : 348, pl. 35, 1950.
- Metatetranychus ulmi*, Oudemans, Ent. Ber., 8 : 198, 1931 ; Pritchard & Baker, Hilgardia, 21 : 260, pl. 2, 1952 ; ———, Rev. Spider Mite Fam. Tetr., p. 128, figs. 93-95, 1955 ; Mori, Mem. Fac. Agr. Hokkaido Univ., 1 : 455, 1953 ; ———, Jap. Jour. Appl. Zool., 19:92, 1954 ; Hukusima, Aomori Nogyô, 4:10, 1953 ; Nishio & Imabayashi, Ann. Rep. Agr. Pest Res. Soc. North Jap., 1953 (no. 4), p. 147, 1953 ; Nishio, Ôyô-Kontyû, 10 : 30, figs., 1954 ; ———, Hokunô, 236 : 376, 1954 ; Ehara, Zool. Mag., 63 : 82, 1954 ; ———, Ibid., 63 : 476, 1954 ; Shinkaji, Agric. & Hort., 29 : 1365, 1954 ; Endo, Control Ins. Pests Veget. & Fruit Trees, p. 228, 1954 ; Tsugawa, Agric. & Hort., 30 : 244, 1955.
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Female. Body from above oval, strongly convex dorsally, 340 μ long in average and 280 μ wide in widest part. Colour brick-red to reddish brown, except legs and dorsal tubercles which are whitish. Distal segment of palpus wider than long ; terminal sensillum spatulate, about as broad as long ; dorsal sensillum small, slender and spindle-shaped ; 5 additional setae present as usual. Mandibular plate (ratio of length to breadth, 10 : 7.5) slightly incised mediodistally. Legs shorter than body. Relative lengths of segments in leg I as follows : Trochanter, 12 ; femur, 26 ; patella, 14 ; tibia, 15 ; tarsus (empodial claw exclusive), 24. Tarsus I dorsally furnished with 2 sets of duplex setae closely set ; 4 setae borne proximad of proximal set of duplex setae ; proximal duplex setae of tarsus I with proximal member about one-third as long as distal member ; distal duplex setae of tarsus I with proximal member about one-eighth as long as distal member. Empodial claw of leg I bearing 3 pairs of proximoventral setae that surpass the claw ; 4 tenent hairs present on onychium as usual. One perfect and one imperfect eye present on each side. Peritreme narrow in breadth, terminated in oval chamber. Dorsum of body with mostly transverse striae. Dorsal setae set on subconical, strong tubercles, long, stout and pubescent.

Eggs spherical, red in colour.

Male. Body from above sagittate in outline, 280 μ long in average and 160 μ wide in average in widest part. Accessories on distal segment of palpus are subequal in arrangement to those in female; terminal sensillum rather slender. Leg I much longer than other legs. The aedeagus is as given in Fig. 22: Basilar lobe prominently present dorsally, shaft rather convex ventrally, narrowing posteriorly, and deflected upward about 50° from the axis of aedeagus to form the hook which is deformed-S-shaped and is tapering to a thin, sharp tip.



Figs. 20-22. *Metaetranychus ulmi*.

20. Dorsal view of female. 21. Distal part of palpus of female. 22. Aedeagus.

Specimens examined. Hokkaido: University Farm, Sapporo, 5 ♂♂ & 20 ♀♀ (on apple), 1. IX, 1953, S. Ehara leg., 3 ♀♀ (on elm), 17. VIII, 1954, H. Takahashi leg.; Kotoni, Sapporo, 7 ♂♂ & 30 ♀♀ (on apple), 14. VIII, 1953, S. Ehara leg.; Hiragishi near Sapporo, 3 ♂♂ & 15 ♀♀ (on apple or on pear), 14. VIII, 1953, S. Ehara leg. Honshu: Hachiman-date, Ishikawa, Aomori Pref., 2 ♂♂ & 5 ♀♀ (on apple), 23. VIII, 1954, S. Ehara leg.; Nagano, Nagano Pref., 5 ♀♀ (on apple), X, 1952, K. Asanuma leg.

Hosts. There have been recorded a number of plants as hosts of this species; some deciduous fruit trees among them are especially infested with it. In Japan, the mite occurs predominantly on apple trees, often damaging them seriously. It seems to be ecologically interesting that Japanese pears, which are planted near citrus trees, sometimes harbor *M. citri* McGregor as well as the mite

here treated, the former closely resembling the latter (Yago and Furukori, 1937a, Ehara, 1955).

Distribution. Japan (Hokkaido and Honshu) ; Europe, New Zealand, North America and Tasmania.

Remarks. In 1905, Kitayama reported that the apple trees were highly infested with a great number of mites in Aomori Prefecture. Judging from Kitayama's short description in which no specific name is given, these mites are probably referable to *Metatetranychus ulmi*. Since 1937 (Yago and Furukori, '37b), the Japanese mite had been used to be named as *Paratetranychus pilosus* C. et F. until in 1953 a few workers adopted *M. ulmi* instead of *P. pilosus*, following the modern acarological current. In the review of Mabry and Walton (1939) on distribution of this species they describe a record from "Japan, Tokyo." The mite is one of the biologically best studied spider mites.

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