Mites of the Subfamily Bryobiinae from Japan (Tetranychidae)[1)]

By

Shôzô Ehara

(Zoological Institute, Faculty of Science, Hokkaido University)

(*With 52 Text-figures*)

In a previous paper the author (1956) reported two species belonging to the subfamily Bryobiinae from Japan; *Bryobia praetiosa* Koch and *Petrobia latens* (Müller). In the present paper three species of the subfamily have been described together with the two former species.

Prior to the subject, the author wishes to express his cordial thanks to Professor Tohru Uchida for his helpful guidance. Thanks are also due to Dr. G. L. van Eyndhoven (Zoölogisch Museum, Amsterdam) for his valuable suggestions. Several zoologists and entomologists have contributed material for this study. The author is very grateful to these collectors.

Key to genera and species (females)

1. Body with four pairs of dorsal setae on propodosoma and with twelve pairs of ones on hysterosoma; ture claw uncinate, with tenent hairs; empodium with tenent hairs. ..... Genus *Bryobia*, 2
–. Body with three pairs of dorsal setae on propodosoma and with ten pairs on hysterosoma; true claw padlike, with a pair of tenent hairs; empodium uncinate, with two series of tenent hairs..... Genus *Petrobia*, 4
2. Dorsal setae of body large and conspicuous; empodium I consisting of a short pad with two pairs of tenent hairs; palpal claw cleft distally; males common. ..... *B. eharai*
–. Dorsal setae of body smaller; empodium I consisting of a single pair of tenent hairs; palpal claw not cleft; males unknown. 3
3. Body 510 to 690 μ long; leg I 660 μ long. Larval setae broad and foliaceous; lateral distance between bases of first dorsocentral hysterosomal setae 48 μ (ratio of this distance to body width, 2.1 : 10). ..... *B. rubrioculus*
–. Body 780 μ long; leg I 840 μ long. Larval setae slender and lanceolate; lateral distance between bases of first dorsocentral hysterosomals 93 μ (ratio of this distance to body width, 4.0 : 10). ..... *B. praetiosa*
4. Dorsal setae of body much longer than intervals between them and arising from strong tubercles; leg I about twice as long as body; males common. ..... *P. harti*

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1) Contribution No. 465 from the Zoological Institute, Faculty of Science, Hokkaido University, Sapporo, Japan.

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Bryobia eharai Pritchard and Keifer

(Figs. 1-6, 39, 40, 43)

Bryobia eharai Pritchard & Keifer, 1958, Ann. Ent. Soc. Amer., 51(5): 506.

Bryobia aequa, Kishida, 1954, Abstr. Lect. Jointed Ann. Meet. Jap. Soc. App. Zool. & Nippon Soc. App. Ent., 1954, p. 4. **nomen nudum.**

Bryobia cristata, Pritchard & Baker (nec Dugès), 1955, Rev. Spider Mite Fam. Tetran., p. 22, Figs. 16–18.

Female. Body elongate oval, 610 μ long and 360 to 400 μ wide, reddish in colour. Distal segment of palpus subcylindrical, with four sensory and three tactile setae; palpal claw cleft distally. Mandibular plate (ratio of breadth to length, 6.7 : 10) slightly notched in front. Leg I about as long as, or slightly longer than body; leg IV not much longer than leg III. Legs with broad, serrate setae (similar to dorsal setae of body) on femur, genu and tibia (except tibia I); outer seta on coxa I serrate, the inner seta longer and slender. Relative lengths of segments in leg I as follows: trochanter, 5; femur, 18; genu, 9; tibia, 13; tarsus (claws exclusive), 10. Tarsus I dorsodistally with two proximate sets of duplex setae. Empodium I padlike, with two pairs of tenent hairs, empodia II to IV each larger, with two series of tenent hairs. Peritreme with long, dilated part distally. Dorsal integument coarsely wrinkled. Anterior margin of propodosoma with two pairs of projection; the inner projections each provided with a broad, serrate seta, much anteriorly extending than the outer projections, each of which is provided with a larger seta. Other dorsal setae than the anterior two pairs are large and spatulate, serrate, and set on moderate tubercles.

Male. Body from above sagittate, 360 μ long and 230 μ wide. Leg I much longer than body. Relative lengths of segments in leg I: trochanter, 4; femur, 18; genu, 9; tibia, 13; tarsus (claws exclusive), 11. Dorsal setae more slender than those in female, though considerably variable in shape individually; their basal tubercles not prominent. Aedeagus is as in Figs. 5–6: distal part directed upward, attenuate, elongate-S-shaped.

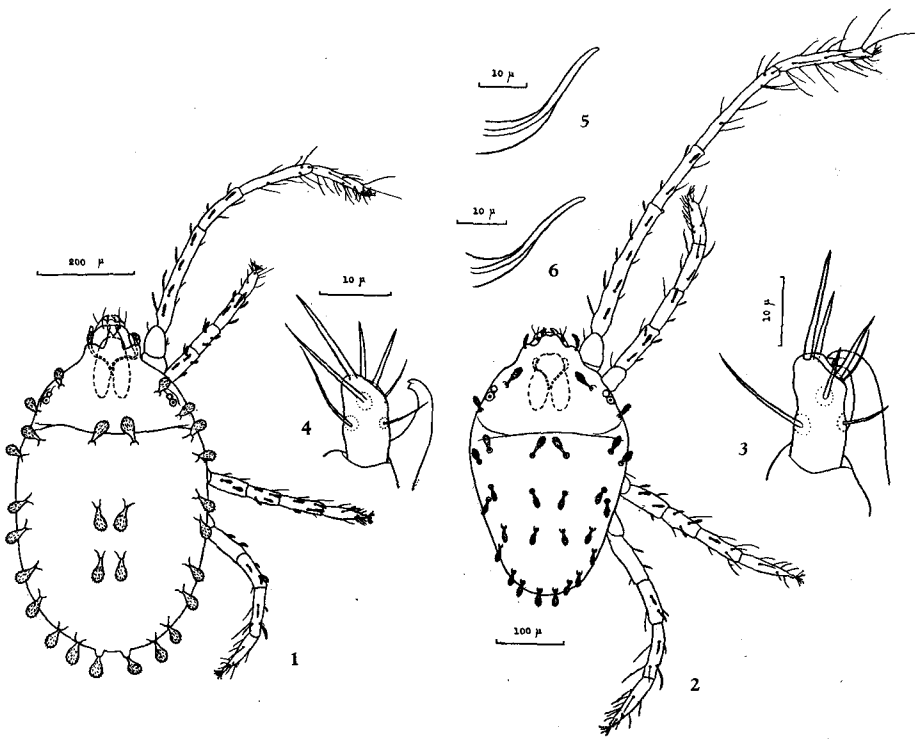
Specimens examined. The following collections (each collection composed of many females, males and immature stages) have been available: Fukuoka, Fukuoka Pref., Kyushu, 23. X, 1955, S. Ehara leg.; Okayama, Okayama Pref., Honshu, 30. VIII, 1955, S. Yabuki leg.; Toyama, Toyama Pref., Honshu, 29. X, 1958, R. Hayashi leg.; Mitake, Tokyo, 17. X, 1955, S. Ehara leg.; Iizaka, Fukushima Pref., Honshu, VIII, 1958, N. Hikichi leg.

Host and distribution. Japan (Honshu, Kyushu, Shikoku[1]), Pakistan;

1) Though no specimens from Shikoku have been available in this study, Kishida (1954) referred the mite (under the name *Bryobia aequa*: nomen nudum) to occur in Shikoku.

parasitic on chrysanthemum.

Remarks. Adult females of *Bryobia eharai* are characterized in the large and spatulate dorsal setae, not always slender, which are set on tubercles. The larvae have slender and foliaceous dorsal setae ; third propodosomal, humeral and anterior three dorsolateral hysterosomal setae tend to be shorter. *B. eharai* was



Figs. 1–6. *Bryobia eharai.* 1. Dorsal view of female. 2. Dorsal view of male. 3. Distal segment of palpus of female. 4. Distal segment of palpus of male. 5, 6. Aedeagus.

recently described by Pritchard and Keifer (1958), based on material on chrysanthemums imported from Japan into Seattle, Washington, U. S. A. This mite, however, has scarcely been known in Japan. In the present redescription the larva and aedeagus from lateral view have been first illustrated. The mite is possibly common on chrysanthemums in Japan except the northern parts.

Bryobia rubrioculus (Scheuten)

(Figs. 7-11, 35, 36, 41)

Sannio rubrioculus Scheuten, 1857, Arch. Naturg., 23(1) : 110–111, Taf. 7, Figs. 12–14.

Bryobia from apple and pear, Eyndhoven, 1955, Ent. Ber., 15(4) : 344, Figs. 4–6.

Bryobia rubrioculus, Eyndhoven, 1956, Ent. Ber., 16(3) : 45.

Bryobia rubrioculus, belonging to the *praetiosa* complex, is distinguished from *praetiosa* by the following characters :

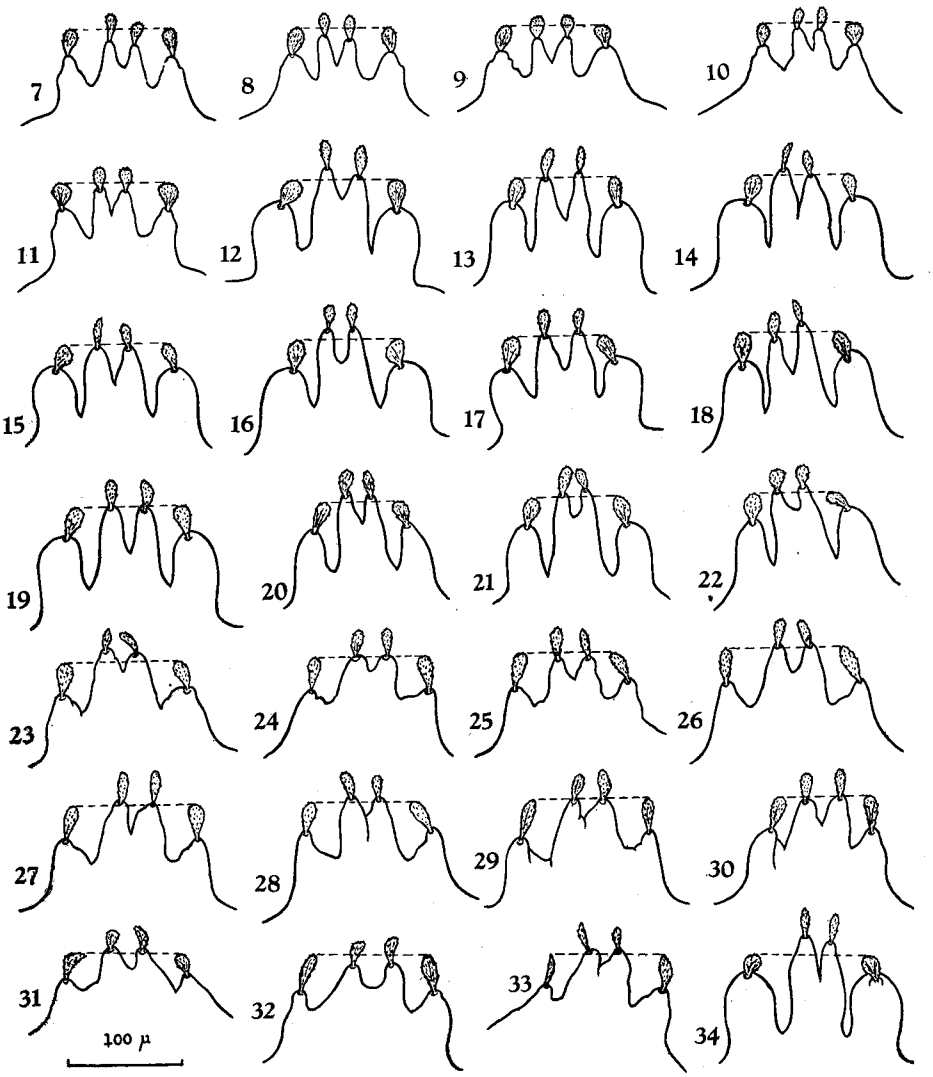
B. rubrioculus	*B. praetiosa*
Body of female 510 to 690 μ long (610 μ in average).	Body of female 780 μ long.
Leg I of female 660 μ long.	Leg I of female 840 μ long.
Setae on outer projections of propodosoma of female generally reaching the middle of those on inner projections.	Setae on outer projections of propodosoma of female, in general, not or hardly reaching the base of those on inner projections.
Larval setae broad and foliaceous.	Larval setae slender and lanceolate.
Lateral distance between bases of first dorsocentral hysterosomal setae of larva 48 μ (ratio of this distance to body width, 2.1 : 10).	Lateral distance between bases of first dorsocentral hysterosomal setae of larva 93 μ (ratio of this distance to body width, 4.0 : 10).

Even in adults, lateral distance between bases of first dorsocentral hysterosomal setae tends to be widely spaced, compared with that in *B. praetiosa*. The relative lengths of segments of leg I are as follows : trochanter, 4 ; femur, 19 ; genu, 8 ; tibia, 15 ; tarsus, 10 (claws exclusive). *B. rubrioculus* cannot always be distinguished from *B. praetiosa* by the relative lengths. Referring Eyndhoven's articles (1955, 1958), the Japanese materials here studied generally accord in structure with European specimens.

The single female of *B. praetiosa*, on apple (Sapporo, 22. VI, 1954), recorded in the author's previous report, is certainly not referable to *B. rubrioculus* but to *B. praetiosa*. Namely, it is known that apple trees in Hokkaido harbour both *B. praetiosa* and *B. rubrioculus*. *Bryobia arborea* Morgan and Anderson, 1957, described from Canada, is possibly a closely related species with *B. rubrioculus*.

Specimens examined. Sapporo, Hokkaido, many females, VII, 1958 (on apple), many immature stages, 7. VII, 1956 (on apple), many larvae, 4. VIII, 1958 (on apple), S. Ehara leg.; many females, 5. VIII, 1959 (on apple), many females, 28. IX, 1959 (on sour cherry), many females, 2. X, 1959 (on sour cherry), H. Mori leg.

Hosts and distribution. Japan (Hokkaido), *newly recorded* ; Europe. Parasitic on apple, cherry and pear.



Figs. 7–34. Showing variations of propodosomal projections of *Bryobia rubrioculus* and *B. praetiosa*. 7–11. *B. rubrioculus*, Sapporo, on apple. 12–19. *B. praetiosa*, type A, Sapporo, on grass. 20–22. *B. praetiosa*, type A, Sapporo, on cabbage. 23–28. *B. praetiosa*, type B, Sapporo, on elm bark. 29, 30. *B. praetiosa*, type B, Okitsu, on pear bark. 31–33. *B. praetiosa*, type B, Morioka, on apple bark or on plants under apple. 34. *B. praetiosa*, type C, Sapporo, on elm.

Bryobia praetiosa Koch

(Figs. 12–34, 37, 38, 42)

Bryobia praetiosa, Ehara, 1956, J. Fac. Sci. Hokkaido Univ., Ser. VI Zool., 12(3) : 244, Figs. 1–2.

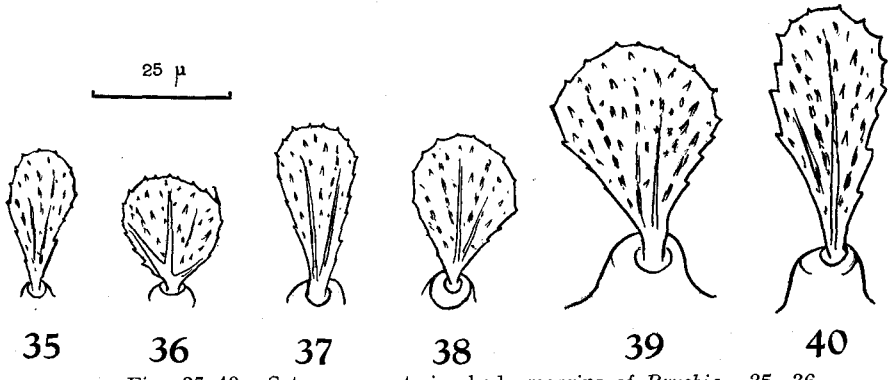
"*praetiosa*" complex, Pritchard & Keifer, 1958, Ann. Ent. Soc. Amer., 51(5) : 504.

Since his previous paper (1956) was published, further collections of *B. praetiosa* have been available to the author. The specimens have been found to vary in external characters by populations (partly pointed out previously by the author). So far as the present material is concerned, the following three types (forms) of adult females have at least been recognized morphologically :

Type A. Leg I about as long as, or slightly longer than body ; length[1] ratio of leg IV to leg I, 5.4 : 10 — 6.0 : 10 ; relative lengths of segments in leg I : trochanter, 5 ; femur, 25 ; genu, 7 ; tibia, 16–19 ; tarsus, 12. Outer projections of propodosoma well developed, rounded distally. Dorsal setae of body short and fanlike.

Specimens examined (females). Sapporo, Hokkaido, many spp., 4. VI, 1957 (on grass), 2 spp., 12. VI, 1954 (on clover), 1 sp., 16. VII, 1954 (on *Campanula medium*), 1 sp., 17. VII, 1954 (on strawberry), 2 spp., 1. VII, 1958 (on piece of wood on earth), S. Ehara leg., many spp., 28. VIII, 1958 (on cabbage), T. Namba leg. ; Hakodate, Hokkaido, 1 sp., 21. VIII, 1954 (on iris), S. Ehara leg. ; Kuroishi, Aomori Pref., Honshu, many spp., 30. V, 1954 (on apple), C. Tsugawa leg., many spp., 25. VIII, 1954 (on clover), S. Ehara leg.

Type B. Leg I about as long as, or slightly longer than body ; length ratio of leg IV to leg I more than 0.7. Relative lengths of segments in leg I : trochanter,



Figs. 35–40. Setae on posterior body margins of *Bryobia*. 35, 36. *B. rubrioculus*. 37, 38. *B. praetiosa*. 39, 40. *B. eharai*.

1) Coxa and tarsal claws are excluded.

5 ; femur, 23 ; genu, 9 ; tibia, 17–19 ; tarsus, 11. Outer projections of propodosoma less developed, more or less triangular, often edentate subdistally. Dorsal setae of body somewhat elongated and slender.

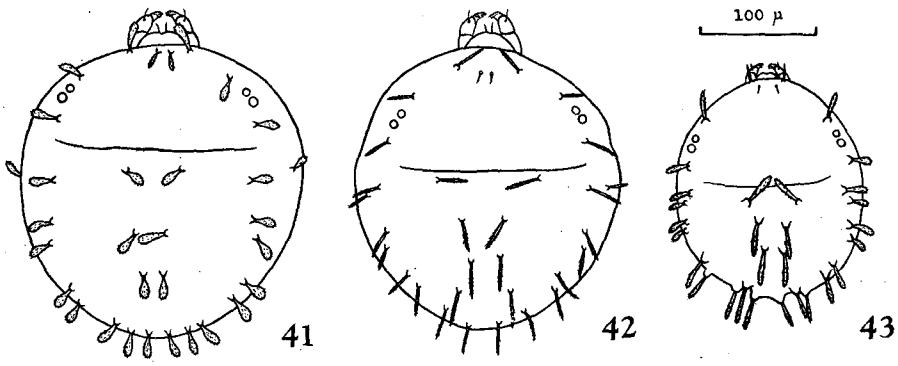
Specimens examined (females). Sapporo, many spp., 1. VII, 1958 (on elm bark), many spp., 1. VII, 1958 (on piece of wood on earth), S. Ehara leg. ; Morioka, Iwate Pref., Honshu, many spp. (*overwintering*), 26. I, 1959 (on apple bark, or on plants under apple tree), M. Kobayashi leg. ; Okitsu, Shizuoka Pref., Honshu, many spp. (*overwintering*), 14. II, 1952 (on pear bark), S. Okudai leg. ; Jyôdô, Okayama Pref., Honshu, many spp. (*overwintering*), 3. II, 1960 (on grape), K. Ando leg.

Type. C. Leg I much longer than body ; length ratio of leg IV to leg I approximately 5.0 : 10. Relative lengths of segments in leg I : trochanter, 6 ; femur, 35; genu, 7 ; tibia, 20; tarsus, 15. Outer projections of propodosoma well developed, rounded distally. Dorsal setae of body short and fanlike.

Specimen examined (female). Sapporo, a single specimen, 1. VII, 1958 (on elm leaf), S. Ehara leg.

The characters distinguishing these types from each other, show a considerable individual variation, even within the same population ; there have been found some intermediate forms as to one or two characters between types A and B. Therefore, types A and B are not distinctly separable from each other. It seems to be evident that Japanese specimens of *B. praetiosa* are not uniform in external characters but polytypic ; the fact generally accords with European authors' results.

Nishio and Imabayashi studying the life history of *B. praetiosa*, reported that adult females of this species occur in early May to the end of June in Sapporo, with an exceptional occurrence on pear in early July (Nishio and Imabayashi, 1956, Nishio, 1958). As recorded here, this mite is found even in the end of August in Sapporo. Furthermore, overwintering adults from Jyôdô, Okayama Pref., Okitsu,



Figs. 41–43. Dorsum of larvae of *Bryobia*. 41. *B. rubrioculus*. 42. *B. praetiosa*. 43. *B. eharai*.

Shizuoka Pref., and Morioka, Iwate Pref., have been examined (Nishio and Imabayashi also said several overwintering adults were collected in a house in Sapporo). Judging from these data, it is easily recognizable that life histories of *B. praetiosa* in Japan are considerably different according to populations and to localities.

B. praetiosa, a taxonomically complicated species, presents as often been called, together with its allied species, the *praetiosa* complex. Further morphological and biological studies on the complex in this country are needed in order to clarify this difficult problem from a worldwide standpoint.

In addition, some larvae have been examined : larvae collected on *Hibiscus* (Sapporo, 7. VI, 1956, S. Ehara leg.) and those collected at base of trunk of apple (Suzaka, Nagano Pref., Honshu, 5. III, 1953, S. Okudai leg.). The former possibly belongs to type A defined above, while the latter is possibly referred to type B. All these larvae have been observed to bear slender and lanceolate dorsal setae on body.

Petrobia harti (Ewing)

(Figs. 44-52)

Neophyllobius harti Ewing, 1909, Trans. Amer. Ent. Soc., 35 : 405, pl. 14, Fig. 7.

Petrobia harti, Pritchard & Baker, 1955, Rev. Spider Mite Fam. Tetran., p. 45, Figs. 28–30 ; Reck, 1959, *Handb. Tetranychoid Mites*, p, 100, Fig. 179.

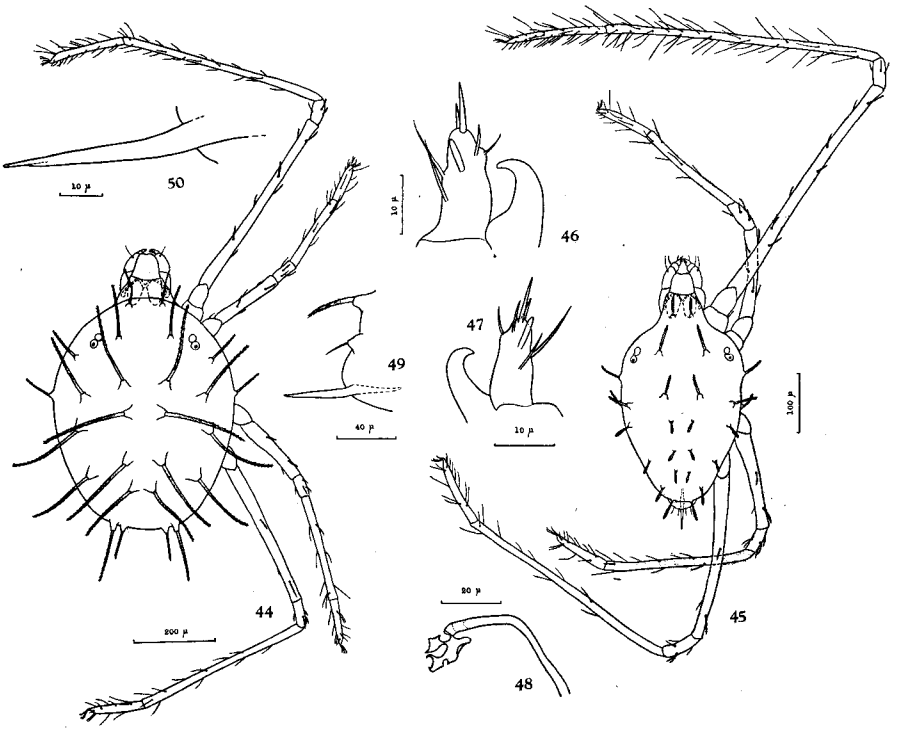
Tetranychina tuberculata Kishida, 1921, Zool. Mag., 33(398) : 449, Figs. 1–4 ; Kishida, 1923, Zool. Mag., 35(416) : 289.

Female. Body rotund, 440 to 550 μ long and 280 to 380 μ wide, red in colour. Distal segment of palpus subcylindrical, with four sensory and three tactile setae, one of the former spindle-shaped. Mandibular plate (ratio of breadth to length, 7 : 10) generally slightly notched in front. Legs long and very slender, leg IV longer than legs II and III but shorter than leg I which is about twice as long as the body. Generally, the setae on femur and genu of legs are broad and serrate, while those on tibia and tarsus are slender and longer. Relative lengths of segments in leg I as follows : trochanter, 4 ; femur, 38–42 ; genu, 5 ; tibia, 38–43 ; tarsus (empodium exclusive), 14. Tarsus I dorsodistally with two proximate sets of duplex setae. Empodium usual for the genus. Peritreme short, irregularly swollen at distal portion. Dorsal setae set on strong, conical tubercles, broad, blunt-ended, setose, and generally longer than intervals between bases. First and third dorsal propodosomal, humeral and clunal setae shorter than other setae on dorsum.

Male. Body from above sagittate, 360 μ long and 180 μ wide. Legs proportionately longer than in female, leg I about three times as long as the body. Relative lengths of segments in leg I : trochanter, 4 ; femur, 37 ; genu, 4 ; tibia, 37–40 ; tarsus (empodium exclusive), 14. Dorsal setae generally arising from small tubercles, more or less clavate, setose, and shorter than intervals between them. First pair of dorsocentral hysterosomal setae long and slender in contrast with second to fourth pairs which are short. Aedeagus lanceolate, nearly straight, generally tapering distally until near distal end where it is abruptly narrowed into

a short, thin distal portion.

Specimens examined. The following collections (each collection composed of many females, males and immature stages) have been studied: Kagoshima, Kagoshima Pref., Kyushu, 31. VIII, 1956, S. Maeda & H. Yajima leg.; Wakamatsu,



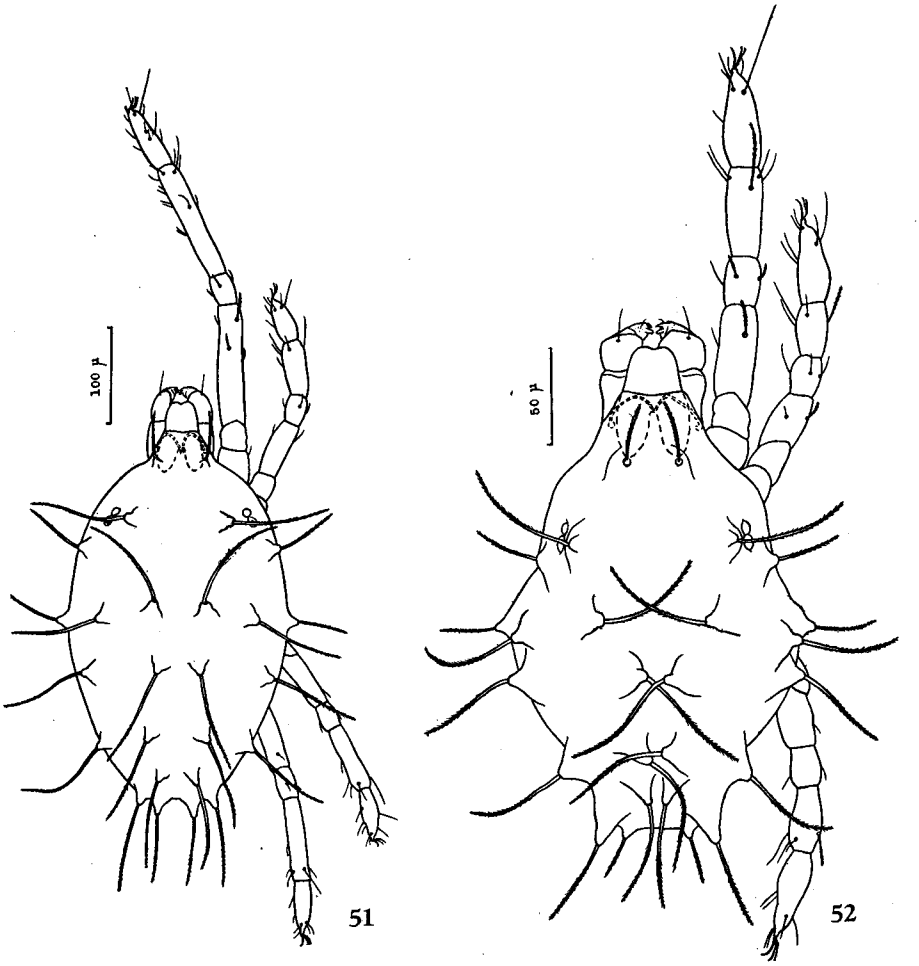
Figs. 44–50. *Petrobia harti.* 44. Dorsal view of female. 45. Dorsal view of male. 46. Distal segment of palpus of female. 47. Distal segment of palpus of male. 48. Peritreme of female. 49. Caudal portion of body of male, lateral view. 50. Aedeagus.

Fukuoka Pref., Kyushu, 17. VII, 1957, K. Inoue leg.; Okitsu, Shizuoka Pref., Honshu, 21. VIII, 1959, N. Shinkaji leg.; Iizaka, Fukushima Pref., Honshu, VIII, 1958, N. Hikichi leg.

Host and distribution.[1] Japan (Honshu; Kyushu, *newly recorded*); Georgian S. S. R., U. S. A. Parasitic on *Oxalis*.

1) Pritchard and Baker are of opinion that *Tenuicrus errabundus* Womersley, 1940, from Australia, and *Tetranychina agerati* Sayed, 1946, from U.A.R. (Egypt), are synonymous with *P. harti*.

Remarks. *Tetranychina*[1] *tuberculata* Kishida, 1921, based on a single female from human urine, was considered by Pritchard and Baker (1955) to be a synonym of *Petrobia harti*. *T. tuberculata* was originally distinguished from *T. harti* in



Figs. 51–52. *Petrobia harti*. 51. Dorsal view of deutonymph. 52. Dorsal view of larva.

several points which are of no validity from a viewpoint of modern acarology. Therefore, the American authors' synonymy is easily acceptable. According to Kishida's description, his material was collected alive in a test tube with human

1) As is pointed out by Pritchard and Baker, the genus *Tetranychina* is possibly a synonym of the genus *Petrobia*.

urine : when collected, it was reddish in colour and moving (Therefore, it may have entered into the test tube accidentally). Since Kishida's discovery from human urine, no record of *P. harti* from this country has been given.

So far as the present author has studied, femur I is longer than, as long as, or shorter than tibia I in female, while the former is as long as, or shorter than the latter in male.

Petrobia latens (Müller)

Petrobia latens, Ehara, 1956, J. Fac. Sci. Hokkaido Univ., Ser. VI Zool., 12(3) : 246, Figs. 3–4 ; Reck, 1959, *Handb. Tetranychoid Mites*, p. 102, Fig. 182.

This mite was recently recorded from Hokkaido by the author (1956). Specimens from Honshu have been available in the present study : many females, Mitama, Yamanashi Pref., 5. III, 1958 (on barley), M. Obi leg. This mite is new to the fauna of Honshu.

References

Papers cited in synonymic lists are excluded here.

Eyndhoven, G. L. van. 1958. New ideas on the genus *Bryobia* (Acari, Tetranychidae). Notulae ad Tetranychidas. Proc. 10th Intern. Congr. Ent., 1 : 927–929.

Morgan, C. V. G. & N. H. Anderson 1957. *Bryobia arborea* n. sp. and morphological characters distinguishing it from *B. praetiosa* Koch (Acarina : Tetranychidae). Canad. Ent., 89(11) : 485–490.

Nishio, Y. 1958. *On the clover mite.* (In Japanese.) Hokkai no Kaju, 60 : 2–3.

Nishio, Y. & S. Imabayashi 1956. Ueber die Anzahl der in einem Jahr an Obstbäumen auftretenden Generationen von Spinnmilben. (In Japanese with German résumé.) Hokkaido Nation. Agr. Exp. Sta. Res. Bull., 70 : 106–112.

Sayed, M. T. 1946. Contribution to the knowledge of the Acarina of Egypt. V. Five new species of Tetranychidae. Bull. Soc. Fouad I Ent., 30 : 79–97.

Womersley, H. 1940. Studies in Australian Acarina – Tetranychidae and Trichadenidae. Trans. Roy. Soc. S. Austr., 64(2) : 233–265.

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–. Dorsal setae of body smaller; empodium I consisting of a single pair of tenent hairs; palpal claw not cleft; males unknown. 3
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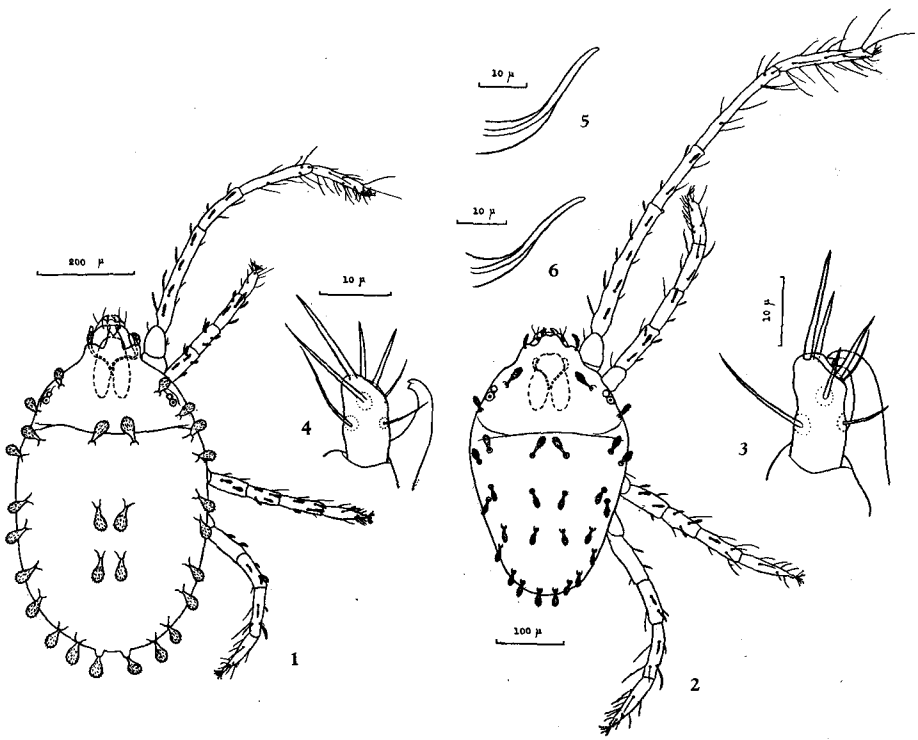
Specimens examined. The following collections (each collection composed of many females, males and immature stages) have been available: Fukuoka, Fukuoka Pref., Kyushu, 23. X, 1955, S. Ehara leg.; Okayama, Okayama Pref., Honshu, 30. VIII, 1955, S. Yabuki leg.; Toyama, Toyama Pref., Honshu, 29. X, 1958, R. Hayashi leg.; Mitake, Tokyo, 17. X, 1955, S. Ehara leg.; Iizaka, Fukushima Pref., Honshu, VIII, 1958, N. Hikichi leg.

Host and distribution. Japan (Honshu, Kyushu, Shikoku[1]), Pakistan;

1) Though no specimens from Shikoku have been available in this study, Kishida (1954) referred the mite (under the name *Bryobia aequa*: nomen nudum) to occur in Shikoku.

parasitic on chrysanthemum.

Remarks. Adult females of *Bryobia eharai* are characterized in the large and spatulate dorsal setae, not always slender, which are set on tubercles. The larvae have slender and foliaceous dorsal setae ; third propodosomal, humeral and anterior three dorsolateral hysterosomal setae tend to be shorter. *B. eharai* was



Figs. 1–6. *Bryobia eharai.* 1. Dorsal view of female. 2. Dorsal view of male. 3. Distal segment of palpus of female. 4. Distal segment of palpus of male. 5, 6. Aedeagus.

recently described by Pritchard and Keifer (1958), based on material on chrysanthemums imported from Japan into Seattle, Washington, U. S. A. This mite, however, has scarcely been known in Japan. In the present redescription the larva and aedeagus from lateral view have been first illustrated. The mite is possibly common on chrysanthemums in Japan except the northern parts.

Bryobia rubrioculus (Scheuten)

(Figs. 7-11, 35, 36, 41)

Sannio rubrioculus Scheuten, 1857, Arch. Naturg., 23(1) : 110–111, Taf. 7, Figs. 12–14.

Bryobia from apple and pear, Eyndhoven, 1955, Ent. Ber., 15(4) : 344, Figs. 4–6.

Bryobia rubrioculus, Eyndhoven, 1956, Ent. Ber., 16(3) : 45.

Bryobia rubrioculus, belonging to the *praetiosa* complex, is distinguished from *praetiosa* by the following characters :

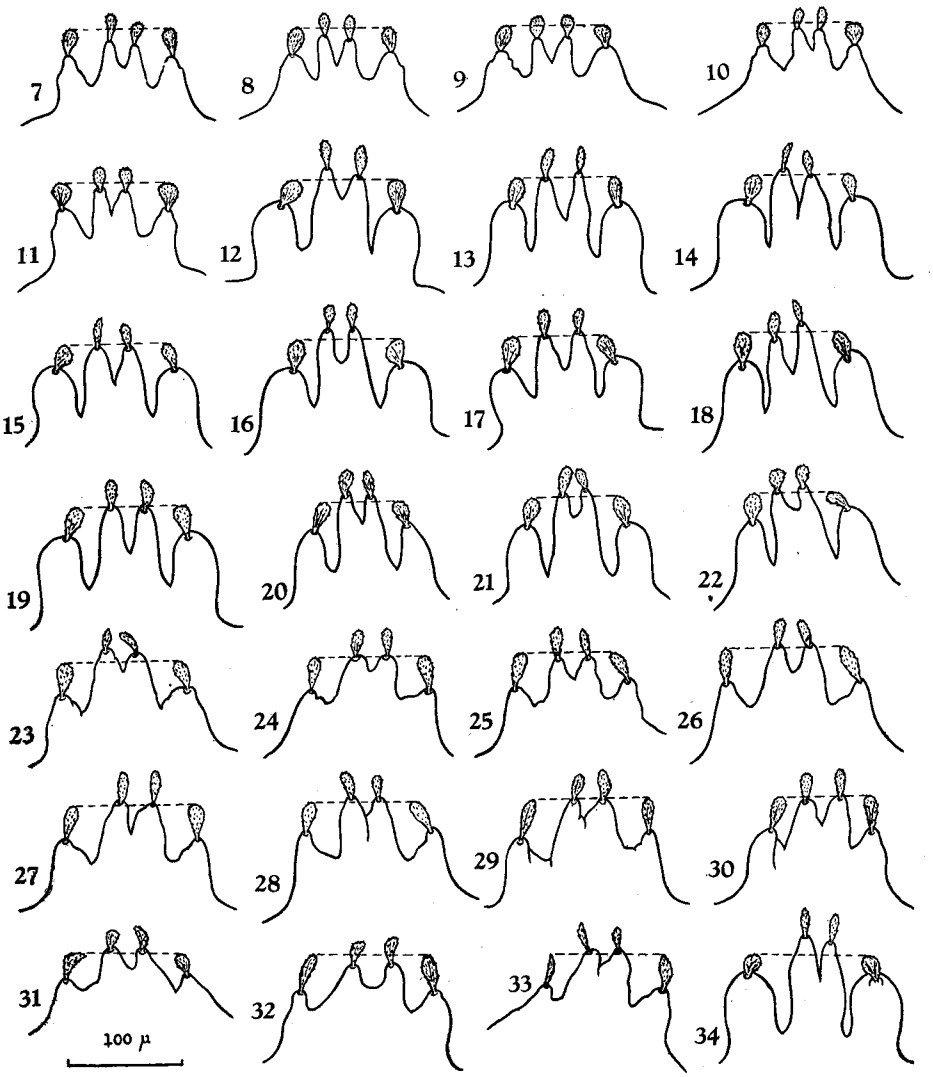
B. rubrioculus	*B. praetiosa*
Body of female 510 to 690 μ long (610 μ in average).	Body of female 780 μ long.
Leg I of female 660 μ long.	Leg I of female 840 μ long.
Setae on outer projections of propodosoma of female generally reaching the middle of those on inner projections.	Setae on outer projections of propodosoma of female, in general, not or hardly reaching the base of those on inner projections.
Larval setae broad and foliaceous.	Larval setae slender and lanceolate.
Lateral distance between bases of first dorsocentral hysterosomal setae of larva 48 μ (ratio of this distance to body width, 2.1 : 10).	Lateral distance between bases of first dorsocentral hysterosomal setae of larva 93 μ (ratio of this distance to body width, 4.0 : 10).

Even in adults, lateral distance between bases of first dorsocentral hysterosomal setae tends to be widely spaced, compared with that in *B. praetiosa*. The relative lengths of segments of leg I are as follows : trochanter, 4 ; femur, 19 ; genu, 8 ; tibia, 15 ; tarsus, 10 (claws exclusive). *B. rubrioculus* cannot always be distinguished from *B. praetiosa* by the relative lengths. Referring Eyndhoven's articles (1955, 1958), the Japanese materials here studied generally accord in structure with European specimens.

The single female of *B. praetiosa*, on apple (Sapporo, 22. VI, 1954), recorded in the author's previous report, is certainly not referable to *B. rubrioculus* but to *B. praetiosa*. Namely, it is known that apple trees in Hokkaido harbour both *B. praetiosa* and *B. rubrioculus*. *Bryobia arborea* Morgan and Anderson, 1957, described from Canada, is possibly a closely related species with *B. rubrioculus*.

Specimens examined. Sapporo, Hokkaido, many females, VII, 1958 (on apple), many immature stages, 7. VII, 1956 (on apple), many larvae, 4. VIII, 1958 (on apple), S. Ehara leg.; many females, 5. VIII, 1959 (on apple), many females, 28. IX, 1959 (on sour cherry), many females, 2. X, 1959 (on sour cherry), H. Mori leg.

Hosts and distribution. Japan (Hokkaido), *newly recorded* ; Europe. Parasitic on apple, cherry and pear.



Figs. 7–34. Showing variations of propodosomal projections of *Bryobia rubrioculus* and *B. praetiosa*. 7–11. *B. rubrioculus*, Sapporo, on apple. 12–19. *B. praetiosa*, type A, Sapporo, on grass. 20–22. *B. praetiosa*, type A, Sapporo, on cabbage. 23–28. *B. praetiosa*, type B, Sapporo, on elm bark. 29, 30. *B. praetiosa*, type B, Okitsu, on pear bark. 31–33. *B. praetiosa*, type B, Morioka, on apple bark or on plants under apple. 34. *B. praetiosa*, type C, Sapporo, on elm.

Bryobia praetiosa Koch

(Figs. 12–34, 37, 38, 42)

Bryobia praetiosa, Ehara, 1956, J. Fac. Sci. Hokkaido Univ., Ser. VI Zool., 12(3) : 244, Figs. 1–2.

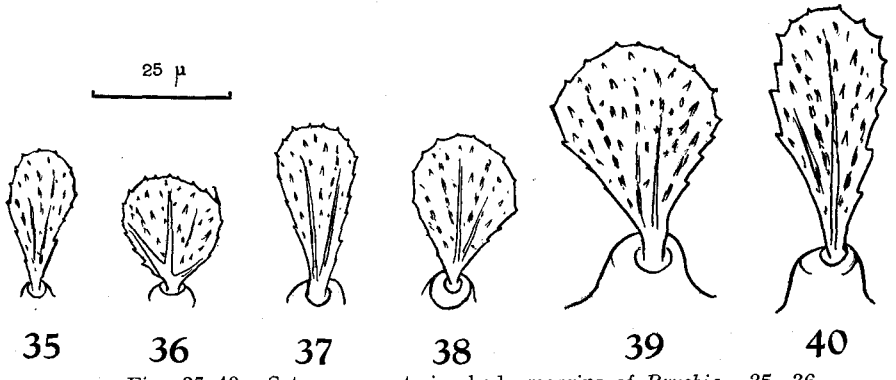
"*praetiosa*" complex, Pritchard & Keifer, 1958, Ann. Ent. Soc. Amer., 51(5) : 504.

Since his previous paper (1956) was published, further collections of *B. praetiosa* have been available to the author. The specimens have been found to vary in external characters by populations (partly pointed out previously by the author). So far as the present material is concerned, the following three types (forms) of adult females have at least been recognized morphologically :

Type A. Leg I about as long as, or slightly longer than body ; length[1] ratio of leg IV to leg I, 5.4 : 10 — 6.0 : 10 ; relative lengths of segments in leg I : trochanter, 5 ; femur, 25 ; genu, 7 ; tibia, 16–19 ; tarsus, 12. Outer projections of propodosoma well developed, rounded distally. Dorsal setae of body short and fanlike.

Specimens examined (females). Sapporo, Hokkaido, many spp., 4. VI, 1957 (on grass), 2 spp., 12. VI, 1954 (on clover), 1 sp., 16. VII, 1954 (on *Campanula medium*), 1 sp., 17. VII, 1954 (on strawberry), 2 spp., 1. VII, 1958 (on piece of wood on earth), S. Ehara leg., many spp., 28. VIII, 1958 (on cabbage), T. Namba leg. ; Hakodate, Hokkaido, 1 sp., 21. VIII, 1954 (on iris), S. Ehara leg. ; Kuroishi, Aomori Pref., Honshu, many spp., 30. V, 1954 (on apple), C. Tsugawa leg., many spp., 25. VIII, 1954 (on clover), S. Ehara leg.

Type B. Leg I about as long as, or slightly longer than body ; length ratio of leg IV to leg I more than 0.7. Relative lengths of segments in leg I : trochanter,



Figs. 35–40. Setae on posterior body margins of *Bryobia*. 35, 36. *B. rubrioculus*. 37, 38. *B. praetiosa*. 39, 40. *B. eharai*.

1) Coxa and tarsal claws are excluded.

5 ; femur, 23 ; genu, 9 ; tibia, 17–19 ; tarsus, 11. Outer projections of propodosoma less developed, more or less triangular, often edentate subdistally. Dorsal setae of body somewhat elongated and slender.

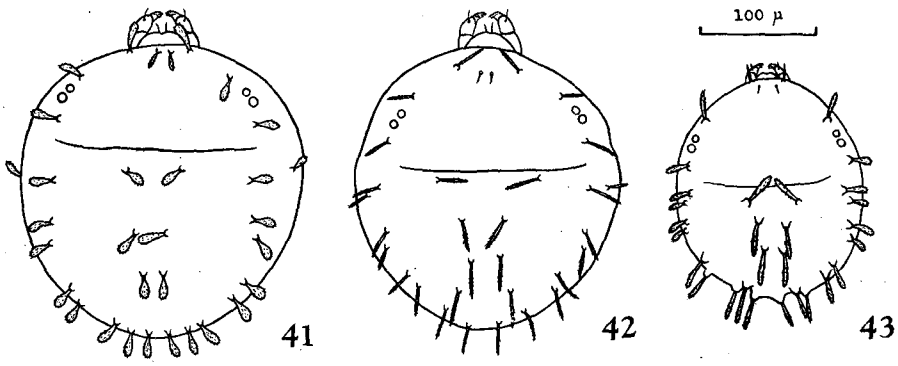
Specimens examined (females). Sapporo, many spp., 1. VII, 1958 (on elm bark), many spp., 1. VII, 1958 (on piece of wood on earth), S. Ehara leg. ; Morioka, Iwate Pref., Honshu, many spp. (*overwintering*), 26. I, 1959 (on apple bark, or on plants under apple tree), M. Kobayashi leg. ; Okitsu, Shizuoka Pref., Honshu, many spp. (*overwintering*), 14. II, 1952 (on pear bark), S. Okudai leg. ; Jyôdô, Okayama Pref., Honshu, many spp. (*overwintering*), 3. II, 1960 (on grape), K. Ando leg.

Type. C. Leg I much longer than body ; length ratio of leg IV to leg I approximately 5.0 : 10. Relative lengths of segments in leg I : trochanter, 6 ; femur, 35; genu, 7 ; tibia, 20; tarsus, 15. Outer projections of propodosoma well developed, rounded distally. Dorsal setae of body short and fanlike.

Specimen examined (female). Sapporo, a single specimen, 1. VII, 1958 (on elm leaf), S. Ehara leg.

The characters distinguishing these types from each other, show a considerable individual variation, even within the same population ; there have been found some intermediate forms as to one or two characters between types A and B. Therefore, types A and B are not distinctly separable from each other. It seems to be evident that Japanese specimens of *B. praetiosa* are not uniform in external characters but polytypic ; the fact generally accords with European authors' results.

Nishio and Imabayashi studying the life history of *B. praetiosa*, reported that adult females of this species occur in early May to the end of June in Sapporo, with an exceptional occurrence on pear in early July (Nishio and Imabayashi, 1956, Nishio, 1958). As recorded here, this mite is found even in the end of August in Sapporo. Furthermore, overwintering adults from Jyôdô, Okayama Pref., Okitsu,



Figs. 41–43. Dorsum of larvae of *Bryobia*. 41. *B. rubrioculus*. 42. *B. praetiosa*. 43. *B. eharai*.

Shizuoka Pref., and Morioka, Iwate Pref., have been examined (Nishio and Imabayashi also said several overwintering adults were collected in a house in Sapporo). Judging from these data, it is easily recognizable that life histories of *B. praetiosa* in Japan are considerably different according to populations and to localities.

B. praetiosa, a taxonomically complicated species, presents as often been called, together with its allied species, the *praetiosa* complex. Further morphological and biological studies on the complex in this country are needed in order to clarify this difficult problem from a worldwide standpoint.

In addition, some larvae have been examined : larvae collected on *Hibiscus* (Sapporo, 7. VI, 1956, S. Ehara leg.) and those collected at base of trunk of apple (Suzaka, Nagano Pref., Honshu, 5. III, 1953, S. Okudai leg.). The former possibly belongs to type A defined above, while the latter is possibly referred to type B. All these larvae have been observed to bear slender and lanceolate dorsal setae on body.

Petrobia harti (Ewing)

(Figs. 44-52)

Neophyllobius harti Ewing, 1909, Trans. Amer. Ent. Soc., 35 : 405, pl. 14, Fig. 7.

Petrobia harti, Pritchard & Baker, 1955, Rev. Spider Mite Fam. Tetran., p. 45, Figs. 28–30 ; Reck, 1959, *Handb. Tetranychoid Mites*, p, 100, Fig. 179.

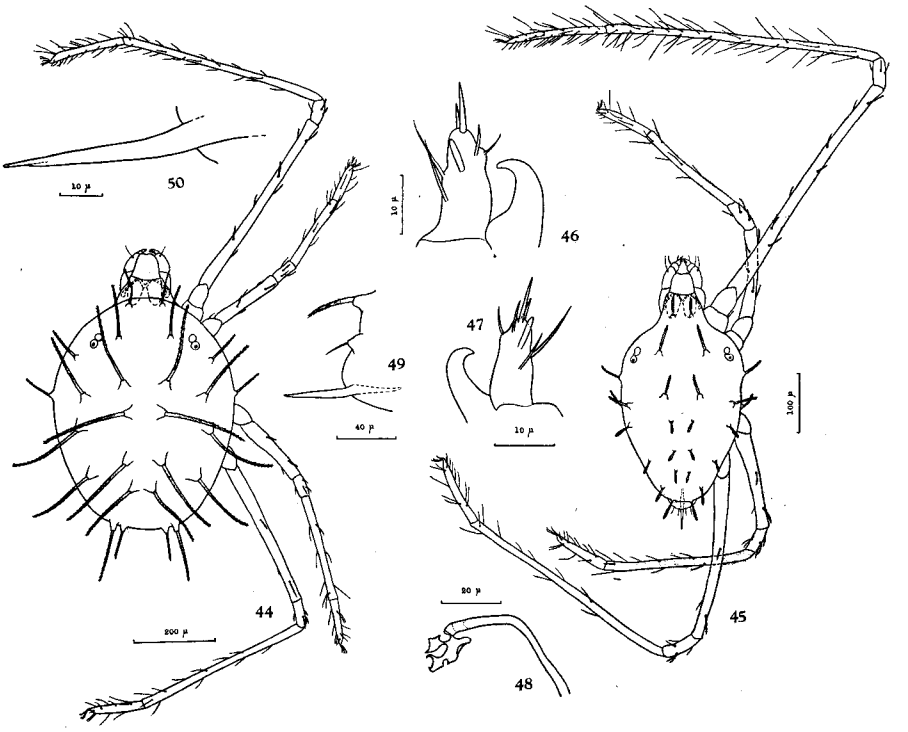
Tetranychina tuberculata Kishida, 1921, Zool. Mag., 33(398) : 449, Figs. 1–4 ; Kishida, 1923, Zool. Mag., 35(416) : 289.

Female. Body rotund, 440 to 550 μ long and 280 to 380 μ wide, red in colour. Distal segment of palpus subcylindrical, with four sensory and three tactile setae, one of the former spindle-shaped. Mandibular plate (ratio of breadth to length, 7 : 10) generally slightly notched in front. Legs long and very slender, leg IV longer than legs II and III but shorter than leg I which is about twice as long as the body. Generally, the setae on femur and genu of legs are broad and serrate, while those on tibia and tarsus are slender and longer. Relative lengths of segments in leg I as follows : trochanter, 4 ; femur, 38–42 ; genu, 5 ; tibia, 38–43 ; tarsus (empodium exclusive), 14. Tarsus I dorsodistally with two proximate sets of duplex setae. Empodium usual for the genus. Peritreme short, irregularly swollen at distal portion. Dorsal setae set on strong, conical tubercles, broad, blunt-ended, setose, and generally longer than intervals between bases. First and third dorsal propodosomal, humeral and clunal setae shorter than other setae on dorsum.

Male. Body from above sagittate, 360 μ long and 180 μ wide. Legs proportionately longer than in female, leg I about three times as long as the body. Relative lengths of segments in leg I : trochanter, 4 ; femur, 37 ; genu, 4 ; tibia, 37–40 ; tarsus (empodium exclusive), 14. Dorsal setae generally arising from small tubercles, more or less clavate, setose, and shorter than intervals between them. First pair of dorsocentral hysterosomal setae long and slender in contrast with second to fourth pairs which are short. Aedeagus lanceolate, nearly straight, generally tapering distally until near distal end where it is abruptly narrowed into

a short, thin distal portion.

Specimens examined. The following collections (each collection composed of many females, males and immature stages) have been studied: Kagoshima, Kagoshima Pref., Kyushu, 31. VIII, 1956, S. Maeda & H. Yajima leg.; Wakamatsu,



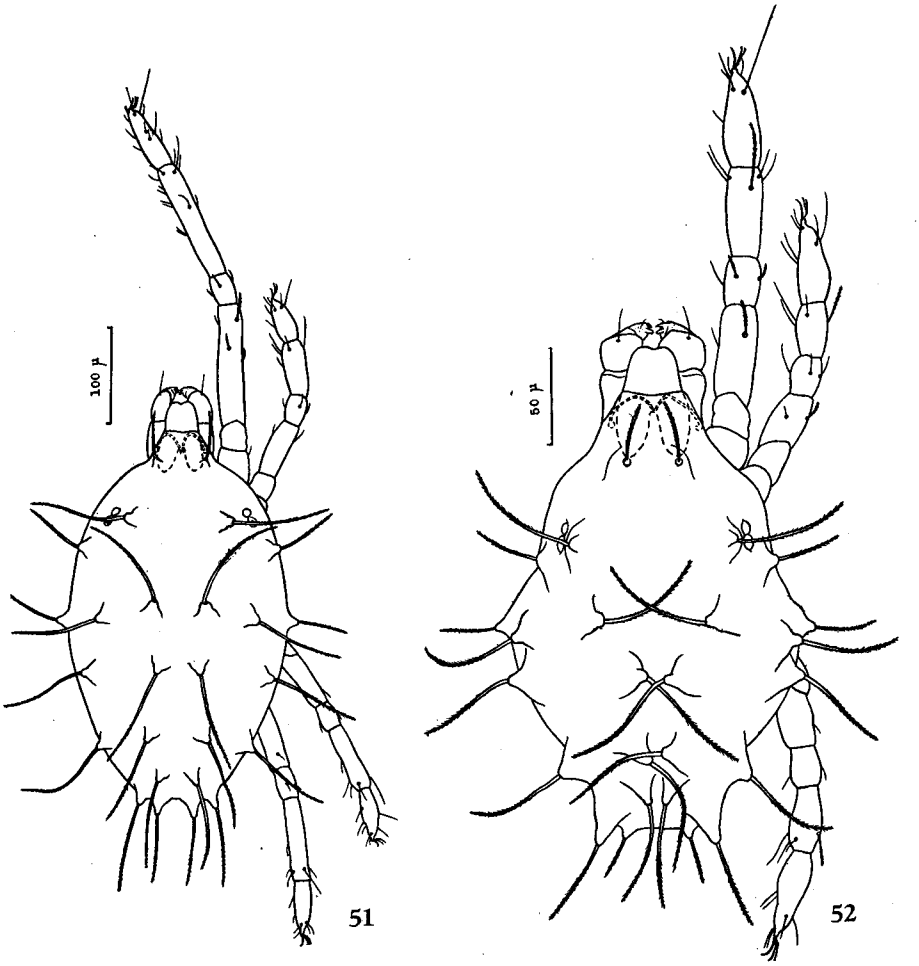
Figs. 44–50. *Petrobia harti.* 44. Dorsal view of female. 45. Dorsal view of male. 46. Distal segment of palpus of female. 47. Distal segment of palpus of male. 48. Peritreme of female. 49. Caudal portion of body of male, lateral view. 50. Aedeagus.

Fukuoka Pref., Kyushu, 17. VII, 1957, K. Inoue leg.; Okitsu, Shizuoka Pref., Honshu, 21. VIII, 1959, N. Shinkaji leg.; Iizaka, Fukushima Pref., Honshu, VIII, 1958, N. Hikichi leg.

Host and distribution.[1] Japan (Honshu; Kyushu, *newly recorded*); Georgian S. S. R., U. S. A. Parasitic on *Oxalis*.

1) Pritchard and Baker are of opinion that *Tenuicrus errabundus* Womersley, 1940, from Australia, and *Tetranychina agerati* Sayed, 1946, from U.A.R. (Egypt), are synonymous with *P. harti*.

Remarks. *Tetranychina*[1] *tuberculata* Kishida, 1921, based on a single female from human urine, was considered by Pritchard and Baker (1955) to be a synonym of *Petrobia harti*. *T. tuberculata* was originally distinguished from *T. harti* in



Figs. 51–52. *Petrobia harti*. 51. Dorsal view of deutonymph. 52. Dorsal view of larva.

several points which are of no validity from a viewpoint of modern acarology. Therefore, the American authors' synonymy is easily acceptable. According to Kishida's description, his material was collected alive in a test tube with human

1) As is pointed out by Pritchard and Baker, the genus *Tetranychina* is possibly a synonym of the genus *Petrobia*.

urine : when collected, it was reddish in colour and moving (Therefore, it may have entered into the test tube accidentally). Since Kishida's discovery from human urine, no record of *P. harti* from this country has been given.

So far as the present author has studied, femur I is longer than, as long as, or shorter than tibia I in female, while the former is as long as, or shorter than the latter in male.

Petrobia latens (Müller)

Petrobia latens, Ehara, 1956, J. Fac. Sci. Hokkaido Univ., Ser. VI Zool., 12(3) : 246, Figs. 3–4 ; Reck, 1959, *Handb. Tetranychoid Mites*, p. 102, Fig. 182.

This mite was recently recorded from Hokkaido by the author (1956). Specimens from Honshu have been available in the present study : many females, Mitama, Yamanashi Pref., 5. III, 1958 (on barley), M. Obi leg. This mite is new to the fauna of Honshu.

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