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# The Tetranychoid Mites of Okinawa Island (Acarina: Prostigmata)<sup>1)</sup>

By

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(With 52 Text-figures)

Up to the present, there has been little information about tetranychoid mites from the Ryukyus (Kishida, 1959). Most of the materials on which this paper is based were collected from various plants in Okinawa Island in April of 1966 by the writer and the staff of the Ryukyu Agricultural Experiment Station, Naha. Some specimens taken in July of the same year by Mr. K. Tsudome of this Station were also employed in this study. After examination, the present materials have been determined to comprise the following eighteen species belonging to three families:

Fam. Tenuipalpidae

1. *Cenopalpus lineola* (Canestrini et Fanzago)
2. *Brevipalpus californicus* (Banks)
3. *Brevipalpus obovatus* Donnadieu
4. *Brevipalpus phoenicis* (Geijskes)
5. *Dolichotetranychus floridanus* (Banks)

Fam. Tuckerellidae

6. *Tuckerella pavoniformis* (Ewing)

Fam. Tetranychidae

7. *Petrobia harti* (Ewing)
8. *Eotetranychus asiaticus* n. sp.
9. *Eotetranychus suginamensis* (Yokoyama)
10. *Schizotetranychus celarius* (Banks)
11. *Oligonychus tsudomei* n. sp.
12. *Oligonychus honodoensis* (Ehara)
13. *Oligonychus orthius* Rimando
14. *Oligonychus uruma* n. sp.
15. *Oligonychus biharensis* (Hirst)
16. *Tetranychus desertorum* Banks
17. *Tetranychus kanzawai* Kishida
18. *Tetranychus piercei* McGregor

1) Contribution No. 760 from the Zoological Institute, Faculty of Science, Hokkaido University, Sapporo, Japan.

*Jour. Fac. Sci. Hokkaido Univ. Ser. VI, Zool. 16, 1966.*

Among the species treated here, only *Brevipalpus obovatus* was recently recorded from Okinawa Island (Kishida, 1959). In this paper the synonymic list of each of the species so far known from Japan includes only the original reference and Japanese literature. The type specimens of the new species are preserved in the Zoological Institute, Faculty of Science, Hokkaido University.

### Superfamily TETRANYCHOIDEA

#### Key to Families

1. Palpus with a claw on penultimate segment..... 2
- Palpus without a claw ..... Tenuipalpidae (p. 2)
2. Hysterosoma with 30 pairs of dorsal setae including caudal flagelliform and foliaceous setae ..... Tuckerellidae (p. 5)
- Hysterosoma with 9 to 12 pairs of dorsal setae, no caudal flagelliform setae.  
..... Tetranychidae (p. 7)

### Family TENUIPALPIDAE

#### Key to Genera of Tenuipalpidae Found in Okinawa Island

1. Palpus with three segments ..... *Dolichotetranychus*
- Palpus with four segments ..... 2
2. Hysterosoma with one pair of dorsosublateral setae ..... *Cenopalpus*
- Hysterosoma without dorsosublateral setae ..... *Brevipalpus*

### *Cenopalpus* Pritchard et Baker

*Cenopalpus* Pritchard & Baker, 1958, Univ. Calif. Publ. Ent. 14: 190.

#### (1) *Cenopalpus lineola* (Canestrini et Fanzago)

(Jap. Name: Matsu-himehadani)

(Fig. 1)

*Tetranychus lineola* Canestrini & Fanzago, 1876, Atti Acc. Sci. ven.-trent.-istr. 5: 105.

*Brevipalpus asyntactus* Baker & Pritchard, 1952, Ann. Mag. Nat. Hist. (12) 5: 612, Figs.

3, 4.

*Cenopalpus lineola*, Pritchard & Baker, 1958, Univ. Calif. Publ. Ent. 14: 191.

*Female*. Body elliptical, slightly convex laterally, widest (175  $\mu$ ) at middle of opisthosoma; body length, including rostrum, 360  $\mu$ . Rostral shield deeply emarginate, with small areolae on median processes. Dorsum of idiosoma coarsely striate; dorsal setae more or less serrate except for second and third dorsocentral hysterosomal setae which are nearly nude and minute. Venter of idiosoma with medioventral propodosomal setae reaching middle of femur I; posterior medioventral metapodosomal setae much longer than anterior pair, reaching suture between propodosoma and hysterosoma. Rostrum reaching middle of femur I, with distal part very narrow and parallel-sided. Palpus with a dorsal seta on penultimate segment, and a sensory rod and two setae (one very small) on distal segment.

Dorsal setae of femora I to III strongly serrate, dorsomedial seta of femur I similar. Tarsi I and II each with a long, sensory seta on posterodistal tubercle.

*Specimens from Okinawa Island.* Six ♀♀, Haneji, 12-VII-1966 (K. Tsudome leg.), on *Pinus luchuensis* Mayr; 1 ♀, Nakijin, 25-IV-1966 (S. Ehara, K. Tsudome and S. Higashihirati leg.), on *Diospyros maritima* Bl.

*Remarks.* This mite has been recorded from the Philippines, Holland, Italy, Portugal, Poland, and Georgian S.S.R., on *Pinus*.

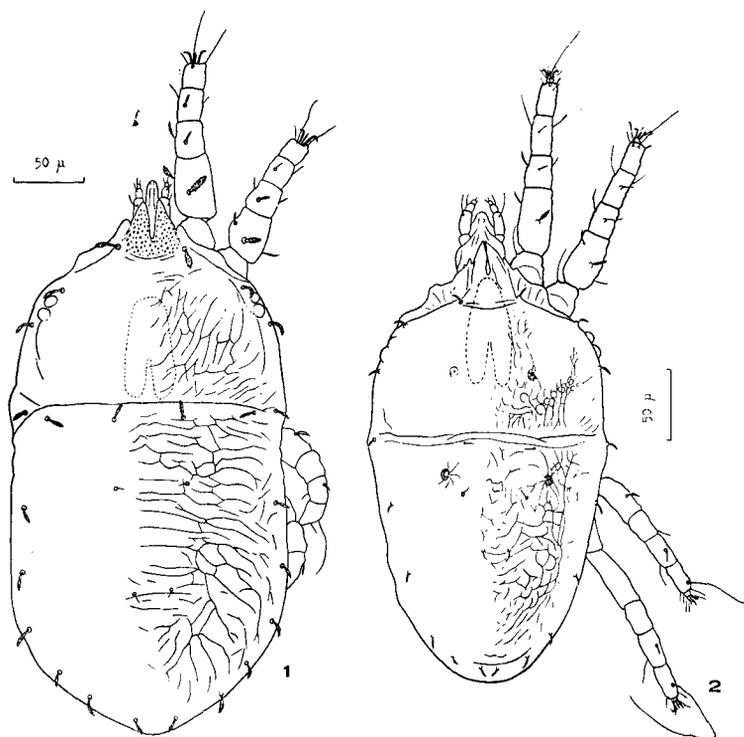


Fig. 1. *Cenopalpus lineola*, dorsum of female. Fig. 2. *Brevipalpus phoenicis*, dorsum of female.

### *Brevipalpus* Donnadieu

*Brevipalpus* Donnadieu, 1775, Rech. serv. Hist. Tetranych. p. 116.

#### Key to Species of *Brevipalpus* in Okinawa Island (Females)

1. Hysterosoma with six pairs of dorsolateral setae ..... *californicus*
- Hysterosoma with five pairs of dorsolateral setae ..... 2
2. Tarsus II with one sensory rod ..... *obovatus*

- Tarsus II with two sensory rods ..... *phoenicis*

(2) *Brevipalpus californicus* (Banks)

*Tenuipalpus californicus* Banks, 1904, Jour. N.Y. Ent. Soc. 12: 55, pl. 2, Fig. 2.

*Brevipalpus californicus*, Ehara, 1962, p. 107, Fig. 1.

This mite is widely distributed in warm parts of the world, and has numerous plant hosts. From Japan it was discovered on *Hibiscus* and *Alpinia* in greenhouses in Hokkaido (Ehara, 1962).

*Specimens from Okinawa Island.* One ♀, Naha (in greenhouse), 27-IV-1966 (K. Miyara, K. Tsudome, I. Tokashiki, S. Higashihirati, K. Uehara and S. Ehara leg.), on a palm.

(3) *Brevipalpus obovatus* Donnadieu

*Brevipalpus obovatus* Donnadieu, 1875, Rech. serv. Hist. Tetranych. p. 116, pl. 5, Figs. 43-48; Ehara, 1958, Abstr. 2nd Symp. Jap. J. Appl. Ent. Zool. p. 45; Kishida, 1959, p. 382.

*Brevipalpus inornatus*, Ehara, 1956b, p. 508, Fig. 32.

*Brevipalpus obovatus* is a cosmopolitan species, and is known to occur in Hokkaido (greenhouse), Honshu, Shikoku and Kyushu, and also in Okinawa Island (Kishida, 1959). The host plants so far recorded for this mite are numerous; tea, mulberry and rhododendron are sometimes seriously affected in Japan proper.

*Specimens from Okinawa Island.* Many ♀♀, Tomigusuku, 22-IV-1966 (K. Miyara et al. leg.), on *Verbena officinalis* L., *Ipomoea indica* (Burm.) Merrill, and a composite plant; many ♀♀, Nakijin, 25-IV-1966 (S. Ehara and K. Tsudome leg.), on *Gerbera*; many ♀♀, Nago, 26-IV-1966 (S. Ehara, K. Tsudome and S. Higashihirati leg.), on tea; 2 ♀♀, Naha, 27-IV-1966 (K. Miyara et al. leg.), on *Physalis pruinosa* Bailey; many ♀♀, Naha (in greenhouse), 27-IV-1966 (K. Miyara et al. leg.), on chrysanthemum.

(4) *Brevipalpus phoenicis* (Geijskes)

(Jap. Name: Minami-himehadani)

(Fig. 2)

*Tenuipalpus phoenicis* Geijskes, 1939, Meded. Landb. Hooges. Wageningen 42: 23, Fig. 7.

*Brevipalpus phoenicis*, Sayed, 1946, Bull. Soc. Fouad 1<sup>er</sup> Ent. 30: 99; Pritchard & Baker, 1952, p. 38, Figs. 38, 39.

This species is a widespread mite, having a great number of host plants. In Asia it is known to occur in Taiwan, the Philippines, Malaya, and India. *B. phoenicis*, having several synonyms, is known to be highly variable among populations (Pritchard and Baker, 1952). In the present materials the dorsum of the propodosoma has few reticulations mediolaterally.

*Specimens from Okinawa Island.* Two ♀♀, Nakijin, 25-IV-1966 (S. Ehara, K. Tsudome and S. Higashihirati leg.), on citrus; 1 ♀, Nakijin, 25-IV-1966 (S. Ehara,

K. Tsudome and S. Higashihirati leg.), on *Diospyros maritima* Bl.

***Dolichotetranychus* Sayed**

*Dolichotetranychus* Sayed, 1938, Bull. Mus. Hist. Nat. Paris (sér. 2), 10: 606.

(5) ***Dolichotetranychus floridanus* (Banks)**

(Jap. Name: Painappuru-himehadani)

(Fig. 3)

*Stigmaeus floridanus* Banks, 1900, U.S. Dept. Agr. Div. Ent. Tech. Ser. 8: 77, Fig. 16.

*Dolichotetranychus floridanus*, Sayed, 1938, Bull. Mus. Hist. nat. Paris (sér. 2), 10: 606, Figs. 8-12; Baker & Pritchard, 1956, p. 374, Figs. 10, 11.

*Female.* Body slender, concave laterally, widest ( $120\mu$ ) at or near the level of coxa III; body length, including rostrum,  $370\mu$ . Dorsum of idiosoma striated as figured. Dorsal propodosomal setae subequal in length; humeral setae and posterior three pairs of dorsolateral hysterosomal setae longer than dorsocentral hysterosomals and anterior two pairs of dorsolateral hysterosomals. Venter of propodosoma with longitudinal striae on anterior part, and transverse striae on posterior part; venter of hysterosoma with longitudinal striae except for anterior narrow, transversely striated region. Anterior pair of medioventral metapodosomal setae much longer than posterior pair. Genital plate with longitudinal striae; two pairs of genital setae. Two pairs of anal setae. Palpus with a dorsal seta and a rod-like distal seta on last segment. Distal end of rostrum at the level just posterior to end of femur I; rostrum with a pair of setae ventrally. Tarsi I and II each with one rod-like sensory seta; tarsi III and IV each with extremely long, whip-like seta. Tarsal claw with a small hook. Femur II with a short dorsal seta.

*Specimens from Okinawa Island.* Ten ♀♀, Gogayama, 26-IV-1966 (S. Ehara, K. Tsudome and S. Higashihirati leg.), on pineapple.

*Remarks.* This mite is known as a pest of pineapple in many parts of the world: the Philippines, Java, Hawaii, North America, and Central America. It was also recorded from Japan by Baker and Pritchard (1956), but the locality within Japan was not given by them.

Family TUCKERELLIDAE

***Tuckerella* Womersley**

*Tuckerella* Womersley, 1940, Trans. Roy. Soc. S. Austr. 64: 244.

(6) ***Tuckerella pavoniformis* (Ewing)**

(Jap. Name: Nami-kenagahadani)

(Fig. 4)

*Eupalopsis pavoniformis* Ewing, 1922, Proc. Ent. Soc. Wash. 24: 106.

*Tuckerella pavoniformis*, McGregor, 1950, Amer. Midl. Nat. 44: 368, pl. 44; Baker & Pritchard, 1953, Ann. Ent. Soc. Amer. 46: 253, Figs. 6 (a, c), 7.

*Female.* Body from above oval, widest ( $200\mu$ ) at the level just posterior to suture between propodosoma and hysterosoma; body length, including rostrum,  $440\mu$ . Dorsum of idiosoma reticulate; propodosoma with four pairs of palmate dorsal setae; hysterosoma with suture between metapodosoma and opisthosoma, with eighteen pairs of more or less palmate setae; last four palmate setae with outer pair larger than inner pair; caudum with six pairs of whip-like, proximally serrate setae (each  $400\mu$  long), and two pairs of small, foliaceous setae. Venter with striations mostly transverse. Stylophore strongly notched mediolaterally. Rostrum very long and narrow, gradually tapering towards the end. Distal segment of palpus with a slender sensillum and four setae. Legs I-III with more or less palmate dorsal setae on femur, genu and tibia; Leg IV with similar setae on genu and tibia. Tarsus I with a long distal and a short proximal sensory rods dorsally. Tarsus II with a short sensory rod dorsodistally.

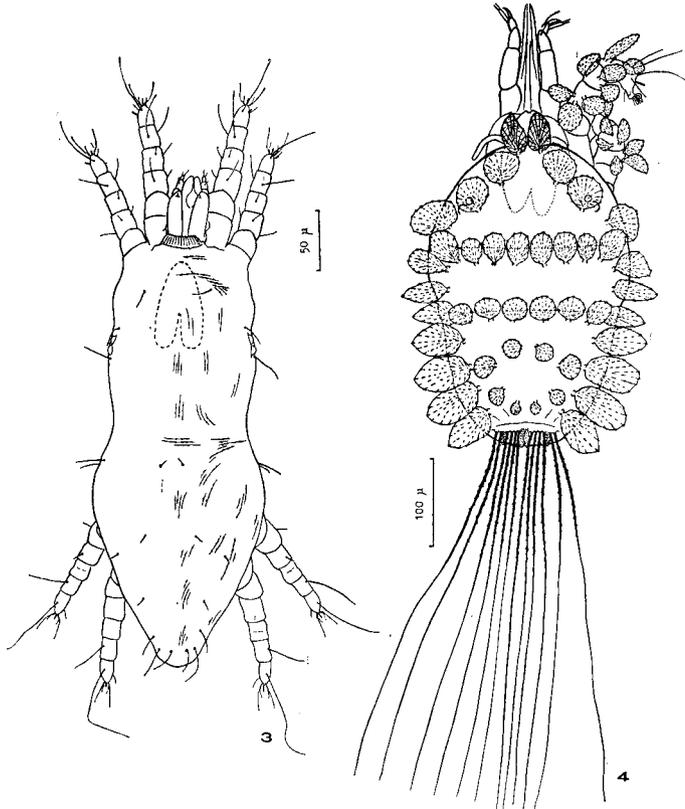


Fig. 3. *Dolichotetranychus floridanus*, dorsum of female. Fig. 4. *Tuckerella pavoniformis*, dorsum of female.

*Specimens examined.* One ♀, Haneji, 12-VII-1966 (K. Tsudome leg.), on *Casuarina equisetifolia* J. et G. Forst.

Specimens from Kyushu<sup>1)</sup> are examined: 1 ♀, Fukuoka, 23-VII-1964 (F.H. Haramoto leg.), on *Pinus Thunbergii* Parlatores; 1 nymph, Kurume, 15-X-1965 (K. Inoue leg.), on pine.

*Remarks.* *Tuckerella pavoniformis* has been known from Hawaii, California, Florida, Georgian S.S.R., and Mauritius on a wide variety of plants (see De Leon, 1955). Miller (1964) states that the record of this mite from Australia is questioned.

#### Family TETRANYCHIDAE

##### Key to Genera of Tetranychidae Found in Okinawa Island

1. Leg I much longer than body; empodium with tenent hairs . . . . . *Petrobia*
- Leg I shorter than, or as long as body; empodium without tenent hairs . . . . . 2
2. Opisthosoma with two pairs of para-anal setae . . . . . 3
- Opisthosoma with a pair of para-anal setae . . . . . 4
3. Empodium (excluding legs I and II of male) consisting of three pairs of hairs . . . . . *Eotetranychus*
- Empodium bifurcate distally . . . . . *Schizotetranychus*
4. Empodium claw-like, with proximoventral hairs . . . . . *Oligonychus*
- Empodium consisting of three pairs of hairs . . . . . *Tetranychus*

#### *Petrobia* Murray

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

#### (7) *Petrobia harti* (Ewing)

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

*Petrobia harti*, Ehara, 1959, p. 192, Figs. 44-52.

*Petrobia harti* is known from Japan (Honshu, Shikoku, Kyushu), the Middle East, Africa, North America and Australia on *Oxalis*. A redescription based on Japanese specimens was presented by the writer (Ehara, 1959).

*Specimens from Okinawa Island.* Many ♂♂ & ♀♀, Naha, 27-IV-1966 (S. Ehara leg.), on *Oxalis* sp.

#### *Eotetranychus* Oudemans

*Eotetranychus* Oudemans, 1931, Ent. Ber. 8: 224.

##### Key to Species of *Eotetranychus* in Okinawa Island (Females)

1. Genital flap with only transverse striae . . . . . *suginamensis*

1) New locality record. The writer is indebted to Dr. F. H. Haramoto, University of Hawaii, Honolulu, and Mr. K. Inoue, Kurume Branch, National Horticultural Research Station, Kurume, for placing these specimens at his disposal.

- Genital flap with longitudinal to oblique striae on anterior part, and transverse striae on posterior part. . . . . *asiaticus* n. sp.

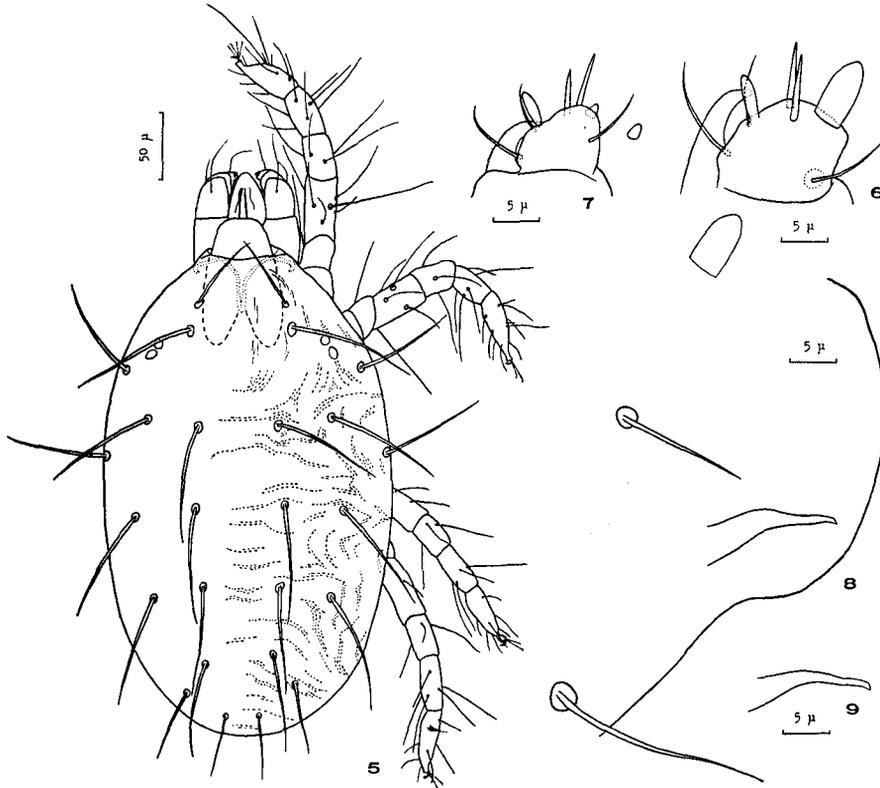
(8) *Eotetranychus asiaticus* n. sp.

(Jap. Name: Kohno-shiro-hadani)

(Figs. 5–13)

*Eotetranychus sexmaculatus* (nec Riley), Ehara, 1956a, p. 142, Figs. 11–21.

*Female.* Body, including rostrum,  $360\mu$  long,  $200\mu$  wide; pale greenish yellow in color, with dark spots along each side. Dorsal setae of idiosoma slender, pubescent, longer than intervals between their bases; inner sacral setae longer than outer sacral setae, the latter longer than clunal setae. Peritreme bent and dilated at distal end. Medioventral opisthosomal setae normal in thickness.



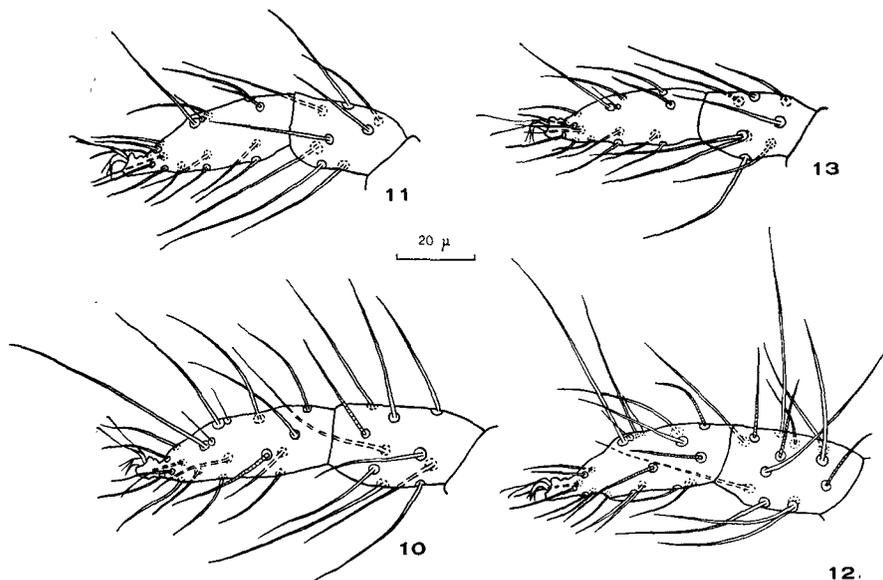
Figs. 5–9. *Eotetranychus asiaticus* n. sp. 5, dorsum of female. 6, distal segment of palpus of female, with terminal sensillum of different specimen. 7, distal segment of palpus of male. 8, 9, aedeagus.

Genital flap with longitudinal to oblique striae on anterior part, with transverse striae on posterior part; area just cephalad of flap with transverse striae. Terminal sensillum of palpus about twice as long as broad; dorsal sensillum slender. Tarsus I with five tactile and one sensory setae proximad of proximal set of duplex setae; tibia I with nine tactile and one sensory setae. Tarsus II with three tactile and one sensory setae proximal to duplex setae; tibia II with eight tactile setae. Tarsi III and IV each with ten tactile and one sensory setae; tibia III with six tactile setae; tibia IV with seven tactile setae.

*Male.* Body, including rostrum,  $220\mu$  long,  $140\mu$  wide. Aedeagus gently curved caudoventrally near middle of shaft, gradually acuminate; the termination angulate, ventrally directed. Terminal sensillum of palpus tiny, subconical, much smaller than dorsal sensillum. Tarsus I with four tactile and two sensory setae proximad of proximal set of duplex setae, one sensory seta near the level of proximal duplex set; tibia I with nine tactile and four sensory setae. Tarsus II with three tactile and one sensory setae proximal to duplex setae; tibia II with eight tactile setae. Tarsi III and IV each with ten tactile and one sensory setae; tibia III with six tactile setae, tibia IV with seven tactile setae.

*Types.* Holotype ( $\delta$ ): Tomigusuku, 22-IV-1966 (K. Miyara *et al.* leg.), on *Ficus erecta* Thunb. Allotype ( $\text{♀}$ ) and paratypes (6  $\hat{\delta}$   $\hat{\delta}$  & 21  $\text{♀}$   $\text{♀}$ ): data same as for holotype.

*Remarks.* *Eotetranychus asiaticus* n. sp. is closely related to *E. sexmaculatus*



Figs. 10-13. *Eotetranychus asiaticus* n. sp. 10, tarsus and tibia I of female. 11, tarsus and tibia II of female. 12, tarsus and tibia I of male. 13, tarsus and tibia II of male.

(Riley), an important pest of citrus in California and Florida, but is different from the latter in having the aedeagus with the angulate termination. (The writer has examined several California specimens of *E. sexmaculatus*.) A mite occurring on citrus and persimmon in Honshu and Kyushu, so far identified with *E. sexmaculatus* (Riley) (Ehara, 1956a), should be referred to *E. asiaticus* n. sp. The writer did not find this new species on citrus and persimmon in Okinawa Island.

(9) *Eotetranychus suginamensis* (Yokoyama)

*Tetranychus suginamensis* Yokoyama, 1932, Bull. Imp. Seric. Exp. Sta. 8: 231, pls. 23, 24.

*Eotetranychus suginamensis*, Ehara, 1956b, p. 501, Figs. 1-14.

This mite, known to occur on mulberry in Hokkaido and Honshu, was recently redescribed by Ehara (1956b).

*Specimens from Okinawa Island.* Many ♂♂ & ♀♀, Nago, 26-IV-1966 (S. Ehara leg.), on mulberry.

*Schizotetranychus* Trägårdh

*Schizotetranychus* Trägårdh, 1915, Stockholm Landtbr.-Akad. Handl. 54: 277.

(10) *Schizotetranychus celarius* (Banks)

*Stigmaeopsis celarius* Banks, 1917, Ent. News 28: 196, pl. 15, Figs. 9, 11.

*Schizotetranychus celarius*, Ehara, 1957, p. 18, Figs. 13-24.

This mite has been known from U.S.A. (Florida, Georgia, California), and Japan (Hokkaido, Honshu, Shikoku, Kyushu). It is a common pest of bamboo and sasa bamboo in Japan (Ehara, 1957). Rice was recently recorded as an occasional host in Nagano Prefecture (Ehara and Miyashita, 1962).

*Specimens from Okinawa Island.* Three ♂♂ & 23 ♀♀, Tamagusuku, 22-IV-1966 (K. Miyara *et al.* leg.) on *Miscanthus sinensis* Anderss.; 2 ♀♀, Tamagusuku, 22-IV-1966 (K. Miyara *et al.* leg.), on *Ficus stipulata* Thunb.; 1 ♀ & nymphs, Nakijin, 25-IV-1966 (K. Miyara leg.), on sugar cane.

*Oligonychus* Berlese

*Oligonychus* Berlese, 1886, Acari Dann. Piante Coltiv. p. 24.

Key to Species of *Oligonychus* in Okinawa Island (Females)

1. Most dorsal setae shorter than distances between bases . . . . . *hondoensis*
- All or most setae longer than distances between bases . . . . . 2
2. Tarsi of legs truncate distally; tibia I with seven tactile and one sensory setae.  
 . . . . . *tsudomei* n. sp.
- Tarsi of legs not truncate; tibia I with nine tactile and one sensory setae.  
 . . . . . 3
3. Tarsus III with ten tactile and one sensory setae . . . . . *biharensis*

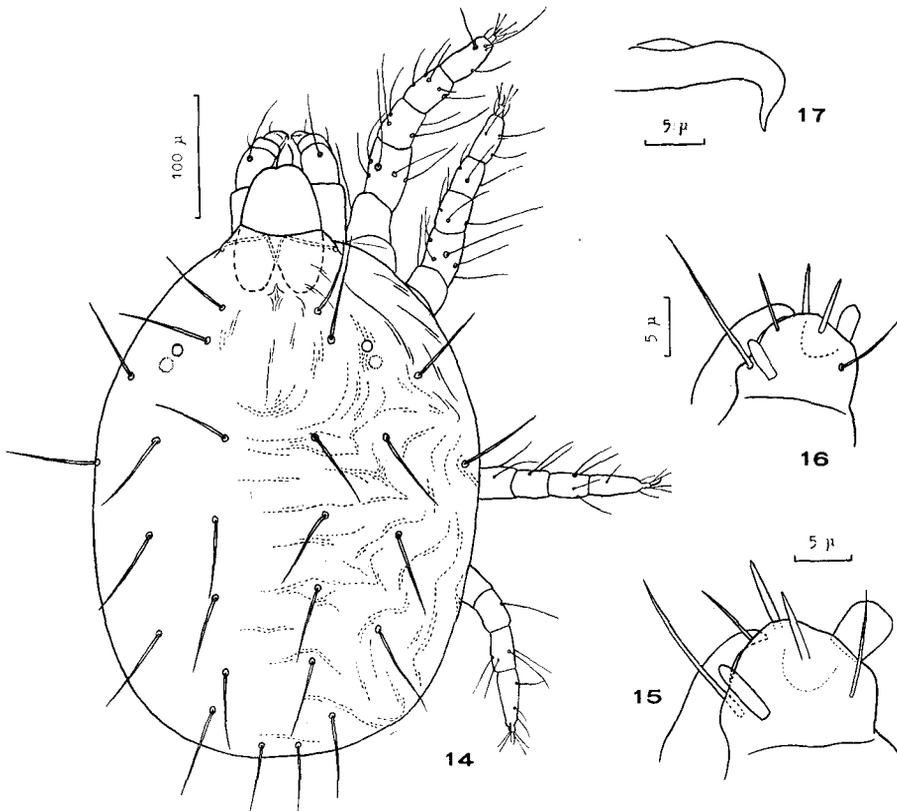
- Tarsus III with nine tactile and one sensory setae..... 4
- 4. Tarsus IV with nine tactile and one sensory setae..... *orthius*
- Tarsus IV with ten tactile and one sensory setae..... *uruma* n. sp.

(11) *Oligonychus tsudomei* n. sp.

(Jap. Name: Ryukyu-hadani)

(Figs. 14-21)

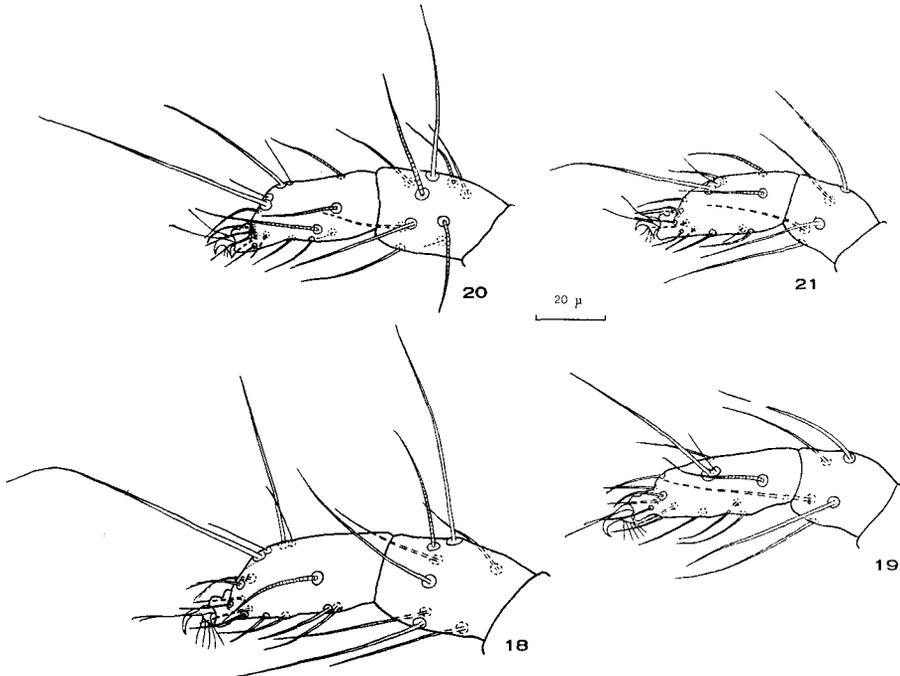
*Female.* Body, including rostrum, 440 $\mu$  long, 280 $\mu$  wide; reddish brown in color. Dorsal setae of idiosoma long and slender, not arising from tubercles; first and second dorsocentral hysterosomal setae approximately as long as distances to bases of setae next behind; outer sacral setae approximately as long as inner sacral setae, slightly longer than clunal setae. Peritreme dilated at distal end.



Figs. 14-17. *Oligonychus tsudomei* n. sp. 14, dorsum of female. 15, distal segment of palpus of female. 16, distal segment of palpus of male. 17, aedeagus.

Medioventral opisthosomal setae normal in thickness. Genital flap transversely striate; area immediately cephalad of flap transversely striate. Terminal sensillum of palpus slightly longer than wide; dorsal sensillum slender. Empodial claw of leg I with five pairs of proximoventral hairs. Tarsi of legs truncate distally. Tarsus I with one or two ventral tactile setae and one (rarely two) sensory seta proximal to proximal pair of duplex setae; tibia I with seven tactile and one sensory setae. Tarsus II with two ventral tactile setae and one sensory seta proximad of duplex setae; tibia II with five tactile setae. Tarsus III with seven tactile and one sensory setae, tarsus IV with six or seven tactile and one sensory setae; tibiae III and IV each with five tactile setae.

*Male.* Body, including rostrum,  $310\mu$  long,  $180\mu$  wide. Dorsal body setae longer than distances between their bases. Aedeagus bent downward to form a hook which is slightly undulate and is tapering to a tip. Terminal sensillum of palpus approximately twice as long as wide, subequal in length to dorsal sensillum. Tarsi of legs truncate distally. Tarsus I with a tiny tactile seta, a longer tactile seta (often lacking) and three sensory setae proximad of proximal pair of duplex setae; tibia I with seven tactile setae (including one tiny seta) and three sensory setae. Tarsus II with two tactile (one tiny) and two sensory setae proximal to



Figs. 18–21. *Oligonychus tsudomei* n. sp. 18, tarsus and tibia I of female. 19, tarsus and tibia II of female. 20, tarsus and tibia I of male. 21, tarsus and tibia II of male.

duplex setae; tibia II with five tactile setae. Tarsi III and IV each with seven tactile and one sensory setae; tibiae III and IV each with five tactile setae.

*Types.* Holotype (♂) and allotype (♀): Haneji, 12-VII-1966 (K. Tsudome leg.), on *Pinus luchuensis* Mayr. Paratypes: 2 ♀ ♀, Nakijin, 25-IV-1966 (S. Ehara leg.), on *Pinus luchuensis* Mayr; 4 ♂ ♂ & 12 ♀ ♀, data same as for holotype.

*Remarks.* *Oligonychus tsudomei* n. sp. is distinct from any other known members of *Oligonychus* in the truncate leg tarsi and leg chaetotactic pattern of both sexes, and in the lengths of dorsocentral hysterosomal setae of female. This mite is named in honor of Mr. K. Tsudome, Ryukyu Agricultural Experiment Station, Naha.

### (12) *Oligonychus hondoensis* (Ehara)

*Paratetranychus hondoensis* Ehara, 1954, Annot. Zool. Jap. 27: 102, Figs. 1-5.

*Oligonychus hondoensis*, Ehara, 1962, J. Fac. Sci., Hokkaido Univ. Ser. 6 Zool. 15: 164, Figs. 16-21.

*Oligonychus weidhaasi* Reeves, 1963, p. 58, Figs. 146-153. n. syn.

This mite is a serious pest of Japanese cedar in Japan. Recently, it was reported to occur in Long Island, New York State, on Japanese cedar (Reeves, 1963).

*Specimens from Okinawa Island.* Four ♀ ♀, Nago, 26-IV-1966 (S. Ehara leg.), on Japanese cedar.

### (13) *Oligonychus orthius* Rimando

(Jap. Name: Satōkibi-hadani)

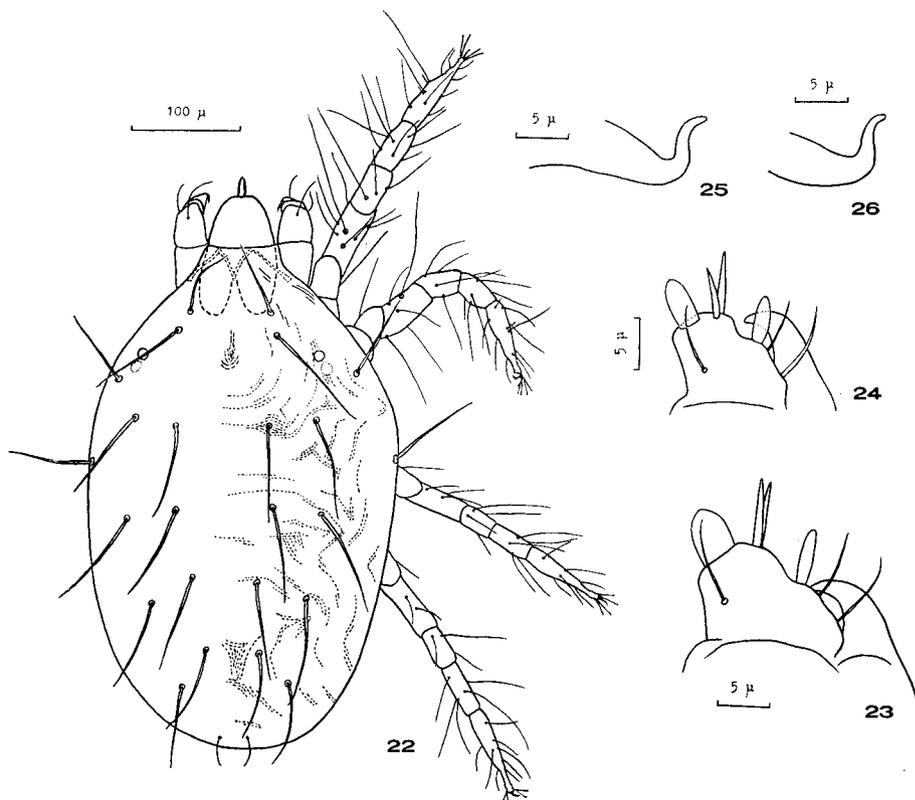
(Figs. 22-30)

*Oligonychus orthius* Rimando, 1962, p. 22, Fig. 11 (in part).

*Tetranychus exsiccator* (nec Zehntner), Kishida, 1959, p. 382.

*Female.* Body, including rostrum, 420 $\mu$  long, 230 $\mu$  wide; straw-colored, with dark spots. Dorsal setae of idiosoma not set on tubercles, slender, pubescent, longer than distances between their bases; outer sacral setae approximately as long as inner sacral setae, clunal setae much shorter. Peritreme dilated and bent at distal end. Medioventral opisthosomal setae normal in thickness. Genital flap with oblique striae on anterior part, with transverse striae on posterior part; area just cephalad of flap with longitudinal striae. Terminal sensillum of palpus longer than wide, approximately as long as dorsal sensillum. Empodial claw of leg I with three pairs of proximoventral hairs. Tarsus I with four tactile setae proximad of proximal set of duplex setae, one sensory seta at or proximal to the level of proximal duplex setae; tibia I with nine tactile and one sensory setae. Tarsus II with three tactile and one sensory setae proximal to duplex setae; tibia II with seven tactile setae. Tarsi III and IV each with nine tactile and one sensory setae; tibia III with six tactile setae, tibia IV with seven tactile setae.

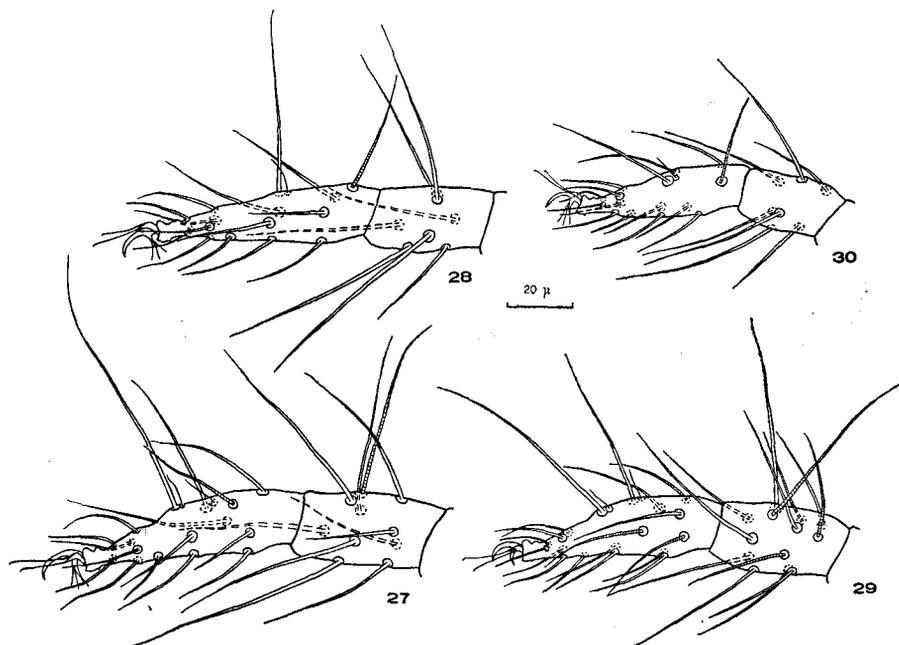
*Male.* Body, including rostrum,  $310\mu$  long,  $160\mu$  wide. Aedeagus bent upward to form a slender, sigmoid distal portion. Terminal sensillum of palpus about twice as long as wide, slightly larger than dorsal sensillum. Tarsus I with four tactile and one sensory setae proximal of proximal set of duplex setae, one sensory seta at or near the level of posterior duplex setae; tibia I with nine tactile and four sensory setae. Tarsus II with three tactile and one sensory setae proximal to duplex setae; tibia II with seven tactile setae. Tarsi III and IV each with nine tactile and one sensory setae; tibia III with six tactile setae, tibia IV with seven tactile setae.



Figs. 22-26. *Oligonychus orthius*. 22, dorsum of female. 23, distal segment of palpus of female. 24, distal segment of palpus of male. 25, 26, aedeagus.

*Specimens from Okinawa Island.* Six ♂♂ & 20 ♀♀, Naha (in greenhouse), 27-IV-1966 (S. Ehara leg.), on sugar cane; 2 ♂♂, Naha, 11-VII-1966 (K. Tsudome leg.), on sugar cane; 2 ♂♂ & 5 ♀♀, Ginowan, 8-VII-1966 (K. Tsudome leg.), on sugar cane; 6 ♂♂ & 27 ♀♀, Tamagusuku, 22-IV-1966 (K. Miyara *et al.* leg.), on Para grass.

*Remarks.* Previously this mite was known only from the Philippines on sugar cane and *Imperata* (Rimando, 1962). The writer has examined the holotype borrowed from the U. S. National Museum.



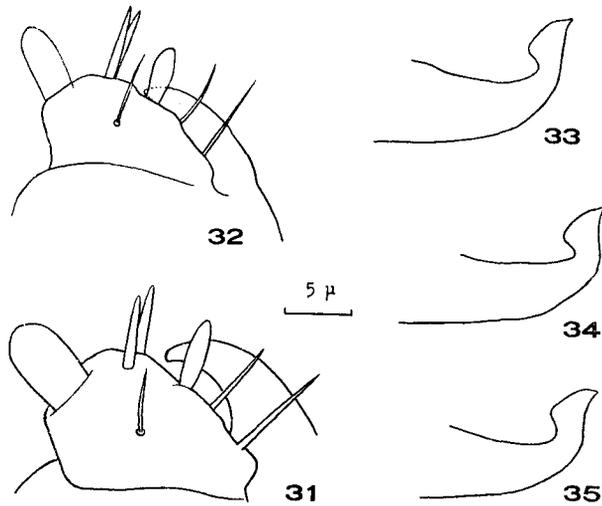
Figs. 27-30. *Oligonychus orthius*. 27, tarsus and tibia I of female. 28, tarsus and tibia II of female. 29, tarsus and tibia I of male. 30, tarsus and tibia II of male.

(14) *Oligonychus uruma* n. sp.

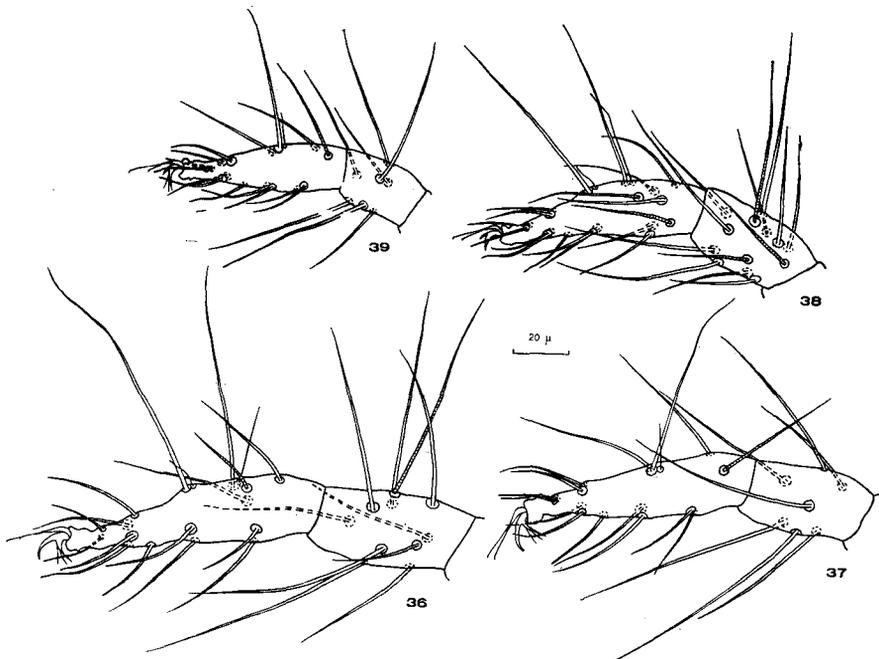
(Jap. Name: Uruma-hadani)

(Figs. 31~39)

*Female.* Body, including rostrum,  $420\mu$  long,  $240\mu$  wide; pale yellowish, with dark spots. Dorsal body setae not arising from tubercles, slender, pubescent, much longer than distances between bases; outer sacral setae approximately as long as inner sacral setae, clunal setae much shorter. Peritreme hooked at distal portion. Medioventral opisthosomal setae normal in thickness. Genital flap with transverse striae; area immediately anterior to flap with longitudinal striae. Terminal sensillum of palpus less than twice as long as broad; dorsal sensillum fusiform. Empodial claw of leg I with three pairs of proximoventral hairs. Proximal set of duplex setae of tarsus I with proximal member highly variable in length; five tactile setae borne proximad of duplexes, sometimes two or three of them at the level of



Figs. 31-35. *Oligonychus uruma* n. sp. 31, distal segment of palpus of female. 32, distal segment of palpus of male. 33, 34, 35, aedeagus.



Figs. 36-39. *Oligonychus uruma* n. sp. 36, tarsus and tibia I of female. 37, tarsus and tibia II of female. 38, tarsus and tibia I of male. 39, tarsus and tibia II of male.

proximal duplex set; one sensory seta near the proximal duplex set; tibia I with nine tactile and one sensory setae. Tarsus II with three tactile and one sensory setae proximal to duplex setae; tibia II with seven tactile setae. Tarsus III with nine tactile and one sensory setae; tibia III with six tactile setae. Tarsus IV with ten tactile and one sensory setae; tibia IV with seven tactile setae.

*Male.* Body, including rostrum,  $320\mu$  long,  $170\mu$  wide. Aedeagus bent dorsad; terminal knob forming a strong angle with the axis of shaft, dorsal margin of knob weakly angulate; anterior projection of knob bluntly angulate, the posterior projection acute. Terminal sensillum of palpus about twice as long as wide, dorsal sensillum slightly shorter than the former. Tarsus I with four tactile and two sensory setae proximal to proximal pair of duplex setae, one sensory seta at or proximal to proximal duplex pair; proximal duplex pair with proximal member about half or more as long as distal member; tibia I with nine tactile and four sensory setae. Tarsus II with three tactile and one sensory setae proximad of duplex setae; tibia II with seven tactile setae. Tarsus III with nine tactile and one sensory setae; tibia III with six tactile setae. Tarsus IV with ten tactile and one sensory setae; tibia IV with seven tactile setae.

*Types.* Holotype ( $\delta$ ): Tomigusuku, 22-IV-1966 (I. Tokashiki leg.), on bamboo. Allotype ( $\text{♀}$ ) and paratypes (5  $\delta$   $\delta$  & 12  $\text{♀}$   $\text{♀}$ ): data same as for holotype.

*Remarks.* The aedeagus of *Oligonychus uruma* n. sp. is similar to that of *O. pratensis* (Banks) from the United States (Pritchard and Baker, 1955), but the terminal knob of the former forms a strong angle with the axis of the shaft. Further, in males of this new species the proximal pair of the duplex setae on tarsus I has the proximal member about a half or more as long as the distal member.

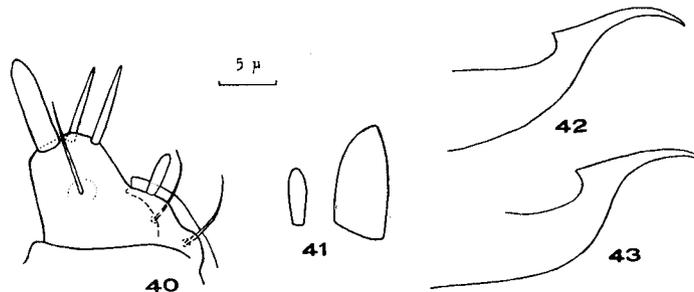
(15) *Oligonychus biharensis* (Hirst)

(Jap. Name: Shurei-hadani)

(Figs. 40-47)

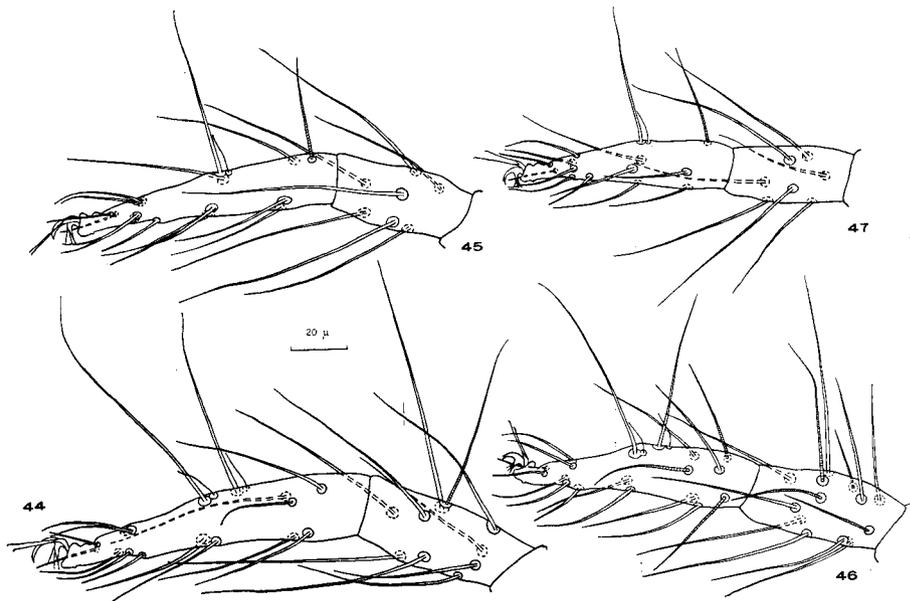
*Paratetranychus biharensis* Hirst, 1925, Proc. Zool. Soc. Lond. 1925: 69, Fig. 15.

*Oligonychus biharensis*, Pritchard & Baker, 1955, p. 364, Figs. 316-318.



Figs. 40-43. *Oligonychus biharensis*. 40, distal segment of palpus of male. 41, dorsal sensillum (left) and terminal sensillum (right) of female palpus. 42, 43, aedeagus.

*Female.* Body, including rostrum,  $430\mu$  long,  $300\mu$  wide; pale yellowish, with dark spots. Dorsal setae of idiosoma not set on tubercles, slender, pubescent, longer than intervals between their bases; outer sacral setae approximately as long as inner sacral setae, clunal setae much shorter. Peritreme U-shaped distally. Medioventral opisthosomal setae normal in thickness. Genital flap transversely striate; area just cephalad of flap longitudinally striate. Terminal sensillum of palpus approximately twice as long as wide, dorsal sensillum small; tibial claw slightly concave at apex. Empodial claw of leg I with three pairs of proximoventral hairs. Tarsus I with four tactile and one sensory setae proximal to proximal set of duplex setae; tibia I with nine tactile and one sensory setae. Tarsus II with three tactile and one sensory setae proximad of duplex setae; tibia II with seven tactile setae. Tarsus III with ten tactile and one sensory setae, tibia III with six tactile setae. Tarsus IV with ten (rarely nine) tactile setae, tibia IV with seven tactile setae.



Figs. 44-47. *Oligonychus biharensis*. 44, tarsus and tibia I of female. 45, tarsus and tibia II of female. 46, tarsus and tibia I of male. 47, tarsus and tibia II of male.

*Male.* Body, including rostrum,  $400\mu$  long,  $200\mu$  wide. Aedeagus bent dorsad; axis of knob parallel to axis of shaft; posterior angulation of knob long and slender, gently curved, the anterior angulation minute, sharp. Terminal sensillum of palpus about four times as long as wide, dorsal sensillum much shorter; tibial claw slightly concave at apex. Tarsus I with four tactile and three sensory

setae proximal to proximal pair of duplex setae; tibia I with nine tactile and four sensory setae. Tarsus II with three tactile and one sensory setae proximal to duplex setae; tibia II with seven tactile setae. Tarsi III and IV each with ten tactile and one sensory setae; tibia III with six tactile setae, tibia IV with seven tactile setae.

*Specimens from Okinawa Island.* Four ♂♂ & 2♀♀, Nakijin, 25-IV-1966 (S. Ehara, K. Tsudome and S. Higashihirati leg.), on *Diospyros maritima* Bl.

*Remarks.* *Oligonychus biharensis* has been recorded from the Philippines, Thailand, India, Hawaii, and Mauritius on various plants.

### *Tetranychus* Dufour

*Tetranychus* Dufour, 1832, Ann. Sci. Nat. Paris 25: 276.

Key to Species of *Tetranychus* in Okinawa Island

1. Tarsus I of female with proximal set of duplex setae more or less in line with proximal tactile setae..... *desertorum*
- Tarsus I of female with proximal set of duplex setae well beyond proximal four tactile setae..... 2
2. Aedeagal knob very large, its axis parallel to axis of shaft..... *kanzawai*
- Aedeagal knob tiny, forming a definite angle with the axis of shaft..... *piercei*

#### (16) *Tetranychus desertorum* Banks

(Fig. 48)

*Tetranychus desertorum* Banks, 1900, U.S. Dept. Agr. Div. Ent., Tech. Ser., Bull. 8: 76, Fig. 14; Ehara, 1956a, p. 144, Figs. 22-26; Ehara, 1960, Jap. J. Appl. Ent. Zool. 4: 238; Ehara, 1962, p. 106.

*Tetranychus desertorum* is known from Japan (Hokkaido, greenhouse; Honshu), North America, South America, and South Africa on many plants. The host plants for this mite in Japan are soybean, *Phaseolus*, eggplant, cucumber and melon.

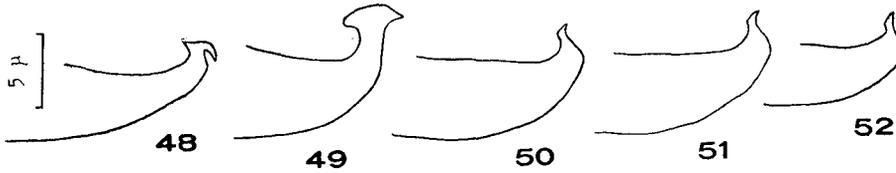
*Specimens from Okinawa Island.* Three ♂♂ & 6♀♀, Naha, 27-IV-1966 (K. Miyara et al. leg.), on *Physalis pruinosa* Bailey; 4♂♂ & 12♀♀, Nago, 26-IV-1966 (I. Tokashiki leg.), on unknown plant.

#### (17) *Tetranychus kanzawai* Kishida

(Fig. 49)

*Tetranychus kanzawai* Kishida, 1927, p. 105; Ehara, 1956b, p. 504, Figs. 15-25; Ehara, 1960, Jap. J. Appl. Ent. Zool. 4: 240; Ehara, 1963, Ibid. 7: 230, Figs. 12-15.

*Tetranychus kanzawai* is widely distributed throughout Japan proper. This mite infests a wide variety of plants including tea, mulberry, grape, hop, apple, pear, peach, citrus, corn, soybean, eggplant, hydrangea, and clover. According to Rimando (1962), it also occurs in the Philippines.



Figs. 48-52. aedeagi. 48, *Tetranychus desertorum*. 49, *T. kanzawai*. 50, 51, 52, *T. piercei*.

*Specimens from Okinawa Island.* Many ♀♀, Naha, 22-IV-1966 (K. Miyara *et al.* leg.), on cherry; many ♀♀, Nago, 26-IV-1966 (S. Ehara, K. Tsudome and S. Higashihirati leg.), on tea; many ♀♀, Nago, 26-IV-1966 (I. Tokashiki leg.), on papaya, cassava and mulberry.

(18) *Tetranychus piercei* McGregor

(Jap. Name: Miyara-hadani)

(Figs. 50~52)

*Tetranychus piercei* McGregor, 1950, Amer. Midl. Nat. 44: 299, Fig. 7, pl. 6 (Fig. 13); Pritchard & Baker, 1955, p. 431, Fig. 385; Rimando, 1962, p. 28, Fig. 12 (in part).

*Tetranychus piercei* belongs to the *urticae* complex, and generally agrees in structure with the members belonging to the complex. The lobes of the dorsal integumentary striae of the hysterosoma are highly variable from acutely angular to semicircular. This species is distinct in that the aedeagal knob is tiny and forms a definite angle with the axis of the shaft, and the posterior projection is short and acute. Body length (including rostrum): female, 560μ; male, 410μ; body width: female, 340μ; male, 180μ.

Previously *T. piercei* was known only from the Philippines on *Clitoria* and *Musa*. The writer has had a chance to examine Philippine specimens of *piercei* borrowed from Dr. L. C. Rimando.

*Specimens from Okinawa Island.* Ten ♂♂ & 24 ♀♀, Naha (in greenhouse), 27-IV-1966 (K. Miyara *et al.* leg.), on sweet potato; 2 ♂♂, Naha (in greenhouse), 27-IV-1966 (K. Miyara *et al.* leg.), on a palm.

Plants and Their Tetranychoid Mite Parasites of Okinawa Island

Host Plants	Mites on Plants
<i>Ananas sativus</i> Lindley	see pineapple
Bamboo	<i>Oligonychus uruma</i> Ehara, n. sp.
<i>Brachiaria mutica</i> Stapf	see Para grass
<i>Carica Papaya</i> L.	see papaya
Cassava	<i>Tetranychus kanzawai</i> Kishida
<i>Casuarina equisetifolia</i> J. et G. Forst.	<i>Tuckerella pavoniformis</i> (Ewing)
Cherry	<i>Tetranychus kanzawai</i> Kishida
Chrysanthemum	<i>Brevipalpus obovatus</i> Donnadieu

Citrus	<i>Brevipalpus phoenicis</i> (Geijskes)
<i>Cryptomeria japonica</i> D. Don	see Japanese cedar
<i>Diospyros maritima</i> Bl.	{ <i>Oligonychus biharensis</i> (Hirst)
	{ <i>Cenopalpus lineola</i> (Can. et Fanz.)
	{ <i>Brevipalpus phoenicis</i> (Geijskes)
<i>Ficus erecta</i> Thunb.	<i>Eotetranychus asiaticus</i> Ehara, n. sp.
<i>Ficus stipulata</i> Thunb.	<i>Schizotetranychus celarius</i> (Banks)
<i>Gerbera</i>	<i>Brevipalpus obovatus</i> Donnadieu
<i>Ipomoea Batatas</i> Lam.	see sweet potato
<i>Ipomoea indica</i> (Burm.) Merrill	<i>Brevipalpus obovatus</i> Donnadieu
Japanese cedar	<i>Oligonychus hondoensis</i> (Ehara)
<i>Manihot utilisima</i> Pohl	see cassava
<i>Miscanthus sinensis</i> Anderss.	<i>Schizotetranychus celarius</i> (Banks)
<i>Morus bombycis</i> Koidzumi	see mulberry
Mulberry	{ <i>Eotetranychus suginamensis</i> (Yokoyama)
	{ <i>Tetranychus kanzawai</i> Kishida
<i>Oxalis</i>	<i>Petrobia harti</i> (Ewing)
Palm	{ <i>Tetranychus piercei</i> McGregor
	{ <i>Brevipalpus californicus</i> (Banks)
Papaya	<i>Tetranychus kanzawai</i> Kishida
Para grass	<i>Oligonychus orthius</i> Rimando
<i>Physalis pruinosa</i> Bailey	{ <i>Tetranychus desertorum</i> Banks
	{ <i>Brevipalpus obovatus</i> Donnadieu
Pineapple	<i>Dolichotetranychus floridanus</i> (Banks)
<i>Pinus luchuensis</i> Mayr	{ <i>Oligonychus tsudomei</i> Ehara, n. sp.
<i>Saccharum officinarum</i> L.	{ <i>Cenopalpus lineola</i> (Can. et Fanz.)
	see sugar cane
Sugar cane	{ <i>Oligonychus orthius</i> Rimando
	{ <i>Schizotetranychus celarius</i> (Banks)
Sweet potato	<i>Tetranychus piercei</i> McGregor
Tea	{ <i>Tetranychus kanzawai</i> Kishida
	{ <i>Brevipalpus obovatus</i> Donnadieu
<i>Thea sinensis</i> L.	see tea
<i>Verbena officinalis</i> L.	<i>Brevipalpus obovatus</i> Donnadieu

### Summary

Eighteen species of phytophagous mites of the superfamily Tetranychoidae are recognized to occur in Okinawa Island. Among these species five belong to the family Tenuipalpidae, one to Tuckerellidae (*Tuckerella pavoniformis* (Ewing)), and twelve to Tetranychidae. The following three species are described as new: *Eotetranychus asiaticus*, *Oligonychus tsudomei*, and *Oligonychus uruma*. Redescriptions or notes are given of the other species, which, except for *Brevipalpus obovatus* Donnadieu, are new to this Island.

*Tuckerella pavoniformis* is first recorded also from Kyushu. A mite infesting citrus and persimmon in Honshu and Kyushu, so far determined with *Eotetranychus sexmaculatus* (Riley), is now referred to *E. asiaticus* n. sp.

The writer wishes to thank Prof. M. Yamada of Hokkaido University and Prof. S. Ikehara of Ryukyu University, who kindly made him possible to survey mite fauna of Okinawa Island. He is also very grateful to the staff of Ryukyu Agricultural Experiment Station: Messers. K. Miyara, K. Tsudome, R. Teruya, I. Tokashiki and S. Higashihirati, and Miss. K. Uehara for their kind assistance in collecting the materials. Further, acknowledgement is made to Dr. E.W. Baker of U.S. Department of Agriculture, Washington, D.C., for the loan of the specimens of *Eotetranychus sexmaculatus* (Riley) and *Oligonychus orthius* Rimando, and to Dr. L.C. Rimando of University of the Philippines, College, for loaning Philippine specimens of *Tetranychus piercei* McGregor.

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