

Two New Spider Mite Species of the *Schizotetranychus celarius* Complex (Acari: Tetranychidae)¹

Yutaka SAITŌ

Laboratory of Applied Zoology, Faculty of Agriculture, Hokkaido University,
Kita-ku, Sapporo 060, Japan

(Received December 21, 1989; Accepted March 26, 1990)

Two new species of the genus *Schizotetranychus* were described. They have formerly known as infra-specific forms of *Schizotetranychus celarius* (BANKS). *Schizotetranychus miscanthi* SAITŌ, n. sp. was collected from a perennial grass, *Miscanthus sinensis* ANDERSS, in Kyushu, Shikoku and Okinawa. It differs from *S. celarius* in the relative lengths of several dorsal setae and their arrangements. *Schizotetranychus longus* SAITŌ, n. sp. was collected from a dwarf bamboo, *Sasa senanensis* (FRANCH. et SAV.) in Hokkaido and Shikoku. It differs from *S. celarius* in the relative lengths of several dorsal setae, and from *S. miscanthi* n. sp. in the form of the empodial claws and in the position of the dorsocentral setae (C₁).

INTRODUCTION

It has been known for some time that there is much variation within the species *Schizotetranychus celarius* (BANKS), as understood by some authors. SAITŌ and TAKAHASHI (1980) showed that at least four morphs are distinguishable in the lengths of their propodosomal setae P₂ and dorsocentral hysterosomal setae D₂ (=C₂ in the present study), and that the setal lengths correspond to the height of nests which the mites weave. These observations and mating experiments (SAITŌ and TAKAHASHI, 1982) suggest that there are several cryptic species within *S. celarius*, which was therefore called the *S. celarius* complex (EHARA, 1989).

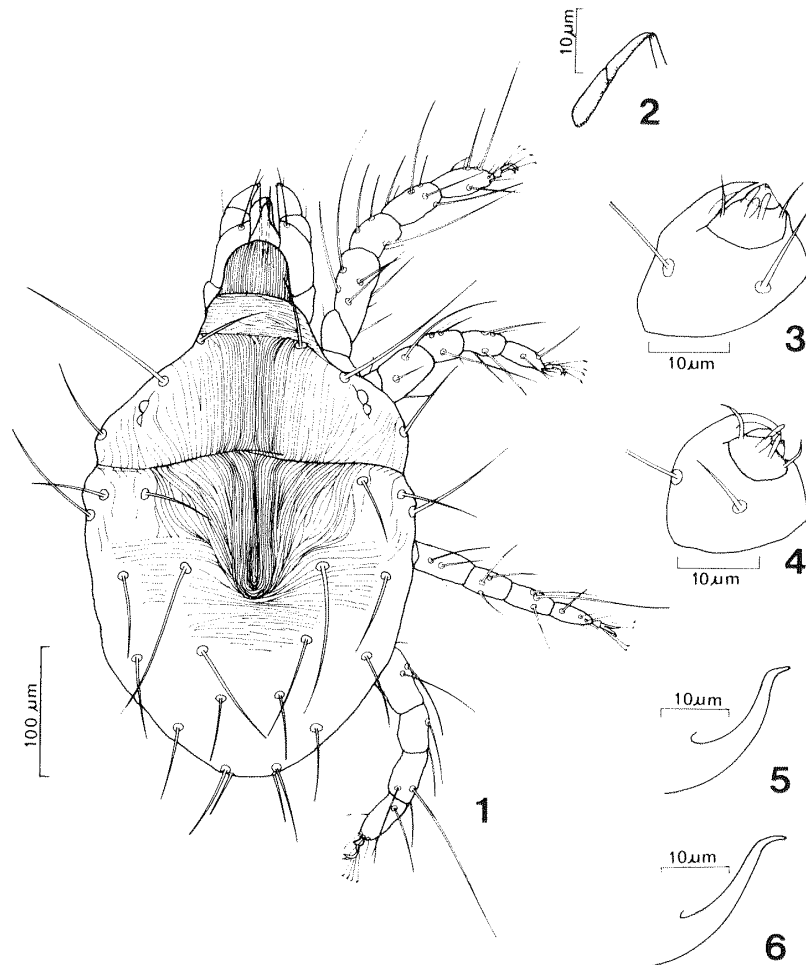
In this paper, two new species belonging to the *S. celarius* complex were described. The holotypes and paratypes are deposited in the collection of the Entomological Institute, Faculty of Agriculture, Hokkaido University.

Schizotetranychus miscanthi n. sp.
(Japanese name: Susuki-sugomori-hadani)
(Figs. 1-10 and 21)

Female. Body flattened, strawy to greenish yellow with small blackish green spots. Body size measurements shown in Table 1. Idiosoma with dorsal setae slender. Propodosoma well demarcated from hysterosoma. Second dorsal propodosomal setae

¹ Study on variation of *Schizotetranychus celarius* (BANKS) III.

This study was supported by Grants-in-Aid for Scientific Research from the Ministry of Education, Science and Culture, Japan (Nos. 62304002, 62304003 and 63440009).



Figs. 1–6. *Schizotetranychus miscanthi* n. sp. 1: dorsum of female, 2: peritreme of female, 3: distal part of palpus of female, 4: distal part of palpus of male, 5–6: aedeagi.

Table 1. Body length and width in *Schizotetranychus miscanthi* n. sp.

	Female ^a	Male ^a
Length 1	372.2 ± 18.7	280.6 ± 16.3
Length 2	440.0 ± 13.7	326.5 ± 12.3
Width	253.5 ± 17.2	203.3 ± 12.7

^a mean ± SD (μm).

Body length 1 means a distance from a transverse line across the bases of setae P₁ to the end of hysterosoma, and 2 means that from the tip of rostrum to the end of hysterosoma.

(P₂) as long as distance between their bases. Bases of first dorsocentral hysterosomal setae deviate laterally from a straight line uniting bases of second and third dorsocentral hysterosomal setae. Second dorsocentral hysterosomal setae (C₂) twice as long as distance between bases of them and consecutive setae (C₃). Lengths of dorsal setae and distances between their bases shown in Table 2. Genital flap and area anterior to it with transverse striae. Spinneret (terminal sensillum) on palpus conical in shape and

Table 2. Length of dorsal setae and distance between their bases in *Schizotetranychus miscanthi* n. sp.

	Female			Male		
	Length ^a	Distance ^a	Ratio ^b	Length ^a	Distance ^a	Ratio ^b
P ₁	58.0±1.6	83.3± 3.8	0.70±0.04	44.2±4.0	61.8± 3.8	0.72±0.07
P ₂	125.6±5.0	133.7± 5.8	0.94±0.06	92.5±3.3	96.1± 4.5	0.96±0.06
P ₃	62.6±2.0	227.0±13.4	0.28±0.02	48.7±3.3	168.4± 9.1	0.29±0.01
C ₁	53.6±6.3	179.2±20.6	0.30±0.02	42.9±4.1	146.2±13.0	0.29±0.03
C ₂	117.9±3.9	100.7± 4.9	1.17±0.06	81.6±3.7	84.1± 4.5	0.97±0.04
C ₃	83.2±9.7	74.8± 5.2	1.12±0.13	47.4±4.8	55.7± 4.3	0.85±0.10
C ₄	49.2±4.0	44.2± 4.1	1.11±0.11	36.7±3.4	28.8± 3.8	1.29±0.17
CL	57.3±3.0	28.9± 3.3	2.00±0.25	31.5±2.3	29.1± 2.1	1.09±0.12
H	89.9±7.9	243.2±17.2	0.37±0.03	58.3±4.8	195.9± 9.2	0.30±0.03
L ₁	60.6±3.0	222.2±14.8	0.27±0.03	45.0±2.4	183.9±11.2	0.25±0.02
L ₂	64.0±3.6	193.3±14.1	0.33±0.02	46.3±5.2	160.9± 8.9	0.29±0.02
L ₃	61.4±3.9	163.0±14.4	0.38±0.03	44.3±3.5	122.2± 6.4	0.36±0.02
L ₄	58.2±2.9	88.7±12.2	0.69±0.12	33.8±2.7	71.6± 4.6	0.47±0.03
PA	37.8±3.3	30.4± 2.2	1.25±0.14	25.3±3.5	29.1± 2.7	0.88±0.16

^a mean±SD (μm), ^b length/distance (mean±SD).

All the specimens measured were flattened enough to show their setae in focus. Symbols of setae according to EHARA and THO (1988).

Table 3. Numbers of setae and solenidia on segments of legs I-IV of *Schizotetranychus miscanthi* n. sp.

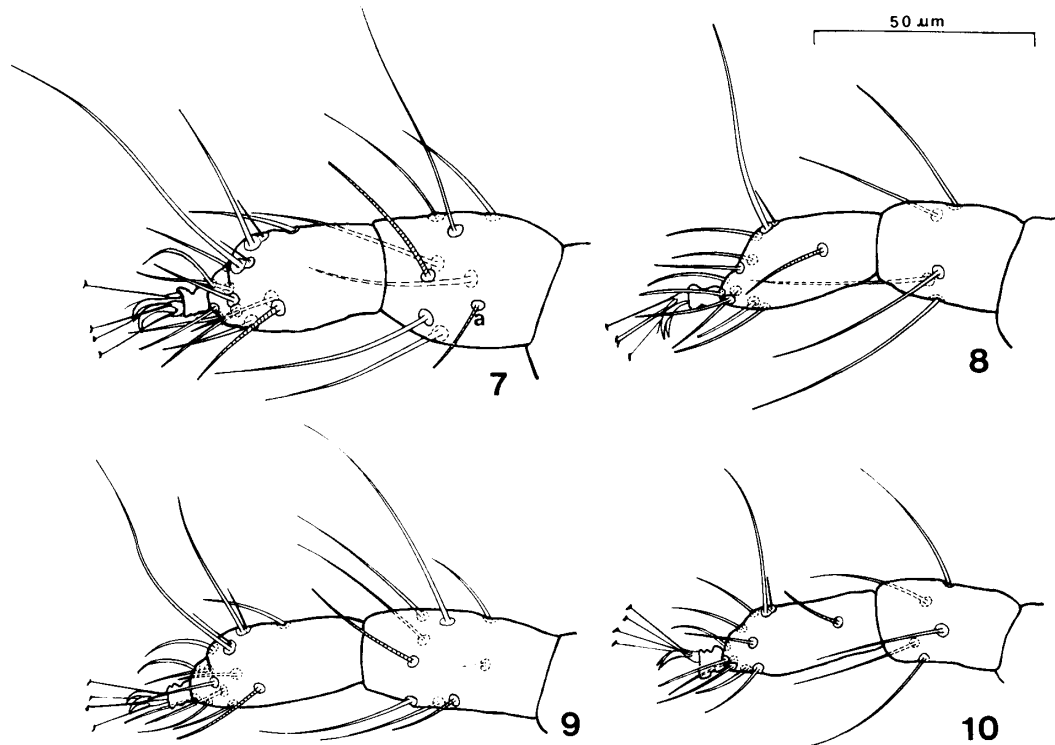
Segments	Legs	Female				Male			
		I	II	III	IV	I	II	III	IV
Femora		8	5	3	3	9	5	3	3
Genua		5	4	3	2	5	4	3	2
Tibiae		7	5	5	5	7	5	5	5
Tarsi		+1s(2s)				+2s			
		10	9	8	8	10	9	8	8
		+1s	+1s	+1s	+1s	+1s	+1s	+1s	+1s
		+2dp	+1dp			+2dp	+1dp		

s: solenidion, dp: duplex set.

about two thirds as long as wide. Numbers of setae and solenidia on leg segments shown in Table 3. Empodia composed of two simple claws, each with a very fine dorsal hair on dorsum (this hair, visible only with a scanning electron microscope, SEM, Fig. 21).

Male. Body size measurements shown in Table 1, while lengths of dorsal setae and distances between their bases presented in Table 2. Aedeagus being broadly curved dorsad. Numbers of setae and solenidia on leg segments summarized in Table 3.

Type series. Holotype: Male, Tsuyazaki, Fukuoka, 23-X-1989 (Y. SAITŌ), on *Miscanthus sinensis* ANDERSS. Paratypes: Three females and 15 males, Tsuyazaki, Fukuoka, 23-X-1989 (YS), on *M. sinensis*, 10 females, Tsuyazaki, Fukuoka, 9-VI-1989 (YS), on *M. sinensis*, 2 females and 2 males, Tsuyazaki, Fukuoka, 24-IX-1987 (YS), on *Miscanthus* sp., 1 female, Muroto, Kouchi, 10-IV-1988 (YS), on *Miscanthus* sp., 1 female, Nishiharachou, Okinawa, 3-IV-1987 (YS) on *Miscanthus* sp.



Figs. 7–10. *Schizotetranychus miscanthi* n. sp. 7: tarsus and tibia I of female. The seta with “a” sometimes absent. 8: tarsus and tibia II of female, 9: tarsus and tibia I of male, 10: tarsus and tibia II of male.

Distribution. Kyushu; Shikoku; Okinawa.

Remarks. *Schizotetranychus miscanthi* resembles *S. longus* n. sp., to be described below. It is distinguishable from the latter in having only one solenidion on tibia I of male, and in the location of the first dorsocentral hysterosomal setae. Furthermore, the empodia markedly differ between these two species, though the difference is only observable with SEM.

S. miscanthi forms colonies on the underside of the leaves of *Miscanthus sinensis* and lives underneath a large dense web. This nesting habit is common to species of the *S. calarius* complex, though there is much variation in nest size (SAITŌ and TAKAHASHI, 1980, 1982).

Schizotetranychus longus n. sp.

(Japanese name: Kenaga-sugomori-hadani)

(Figs. 11–20 and 22)

Female. Body flattened, strawy to greenish yellow with small blackish green spots. Body size measurements presented in Table 4. Idiosoma with slender dorsal setae. Propodosoma well demarcated from hysterosoma, and second dorsal propodosomal setae (P_2) as long as distance between their bases. Bases of all dorsocentral hysterosomal setae (C_1 – C_4) placed approximately on a straight line. Second and third dorsocentral hysterosomal setae (C_2 , C_3) more than twice as long as distance between bases of them and consecutive setae (C_3 and C_4 , respectively). Lengths of dorsal setae and distances

Table 4. Body length and width in *Schizotetranychus longus* n. sp.

	Female ^a	Male ^a
Length 1	378.0±11.5	271.8±16.8
Length 2	435.4±20.9	331.1±23.4
Width	255.1± 7.4	186.1±13.8

^a mean±SD (μm).Body length 1 means a distance from a transverse line across the bases of setae P₁ to the end of hysterosoma, and 2 means that from the tip of rostrum to the end of hysterosoma.Table 5. Length of dorsal setae and distance between their bases in *Schizotetranychus longus* n. sp.

	Female			Male		
	Length ^a	Distance ^a	Ratio ^b	Length ^a	Distance ^a	Ratio ^b
P ₁	54.2±2.3	86.2±2.9	0.63±0.02	38.8±2.4	67.3± 1.4	0.58±0.04
P ₂	131.7±6.5	129.7±3.3	1.02±0.04	91.3±3.8	97.2± 2.1	0.94±0.06
P ₃	66.6±4.7	192.7±6.5	0.35±0.03	43.5±3.1	162.8± 4.2	0.27±0.02
C ₁	47.3±2.6	123.9±8.6	0.38±0.03	35.6±2.7	99.4± 6.9	0.37±0.03
C ₂	125.6±6.3	94.3±2.6	1.33±0.06	84.1±5.0	70.8± 2.8	1.19±0.05
C ₃	93.3±7.4	71.2±3.8	1.31±0.09	63.8±6.4	52.0± 4.4	1.24±0.19
C ₄	63.8±2.8	43.8±6.0	1.48±0.18	42.6±2.3	29.2± 2.6	1.47±0.12
CL	62.9±4.8	22.6±1.1	2.81±0.27	37.7±3.9	19.8± 2.1	1.78±0.35
H	107.5±6.3	206.6±6.5	0.52±0.03	70.6±5.4	198.4± 6.8	0.36±0.03
L ₁	57.1±3.2	166.9±6.6	0.34±0.01	39.2±2.8	157.6±10.1	0.25±0.03
L ₂	56.1±2.8	154.4±5.0	0.36±0.02	39.3±2.1	143.0± 4.7	0.28±0.02
L ₃	58.3±2.0	126.5±4.5	0.46±0.02	39.3±0.7	106.7± 2.9	0.37±0.01
L ₄	61.7±4.2	89.6±6.9	0.70±0.09	40.4±3.2	67.3± 2.9	0.61±0.04
PA	45.5±2.8	37.2±3.9	1.21±0.16	28.0±3.0	— ^c	— ^c

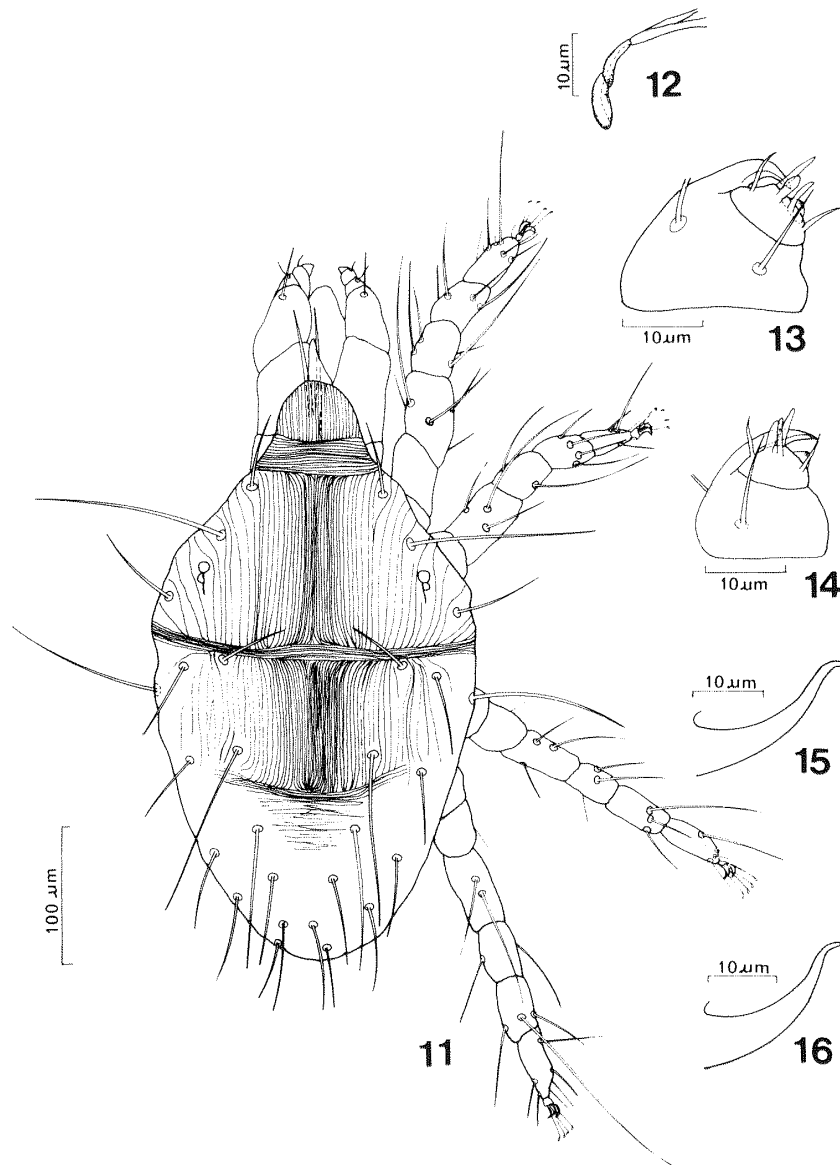
^a mean±SD (μm), ^b length/distance (mean±SD), ^c impossible to measure on flattened specimens.

All the specimens measured were flattened enough to show their setae in focus. Symbols of setae according to EHARA and THO (1988).

Table 6. Numbers of setae and solenidia on segments of legs I–IV of *Schizotetranychus longus* n. sp.

Segments	Legs	Female				Male			
		I	II	III	IV	I	II	III	IV
Femora		8	5	3	3	9	5	3	3
Genua		5	4	3	2	5	4	3	2
Tibiae		7	5	5	5	7	5	5	5
Tarsi	+1s					+2s			
	10	9	8	8	10	9	8	8	
	+1s	+1s	+1s	+1s	+2s	+1s	+1s	+1s	
	+2dp	+1dp			+2dp	+1dp			

s: solenidion, dp: duplex set.

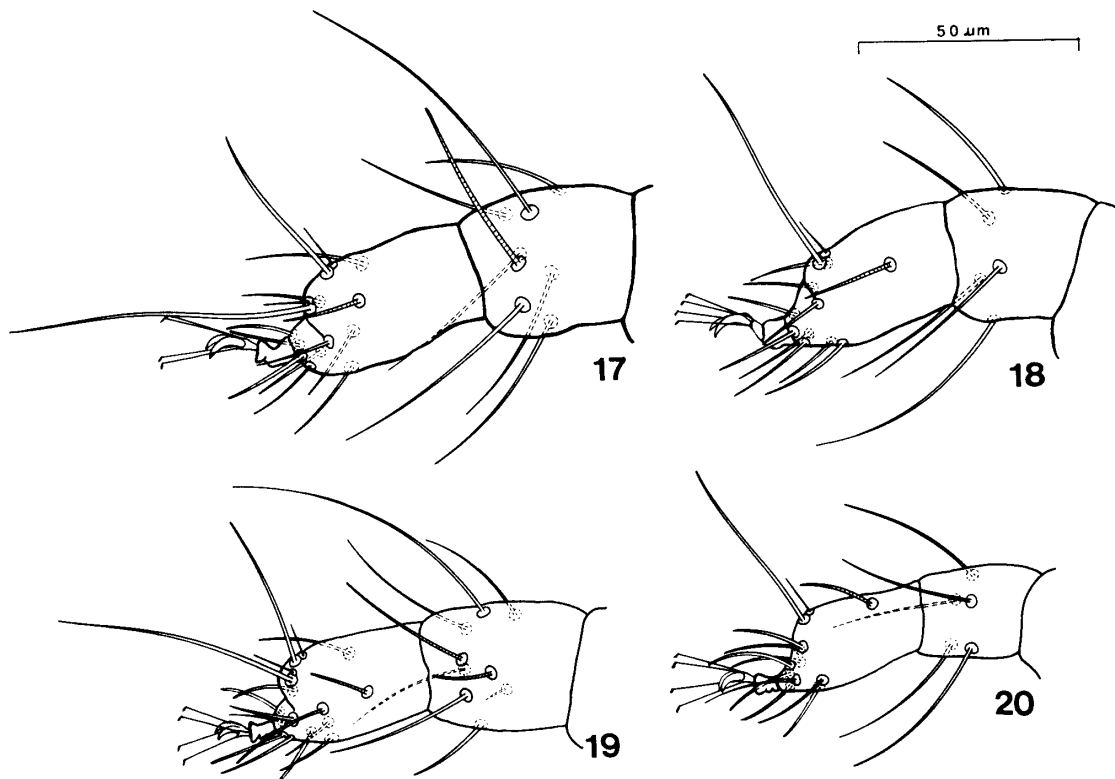


Figs. 11–16. *Schizotetranychus longus* n. sp. 11: dorsum of female, 12: peritreme of female, 13: distal part of palpus of female, 14: distal part of palpus of male, 15–16: aedeagi.

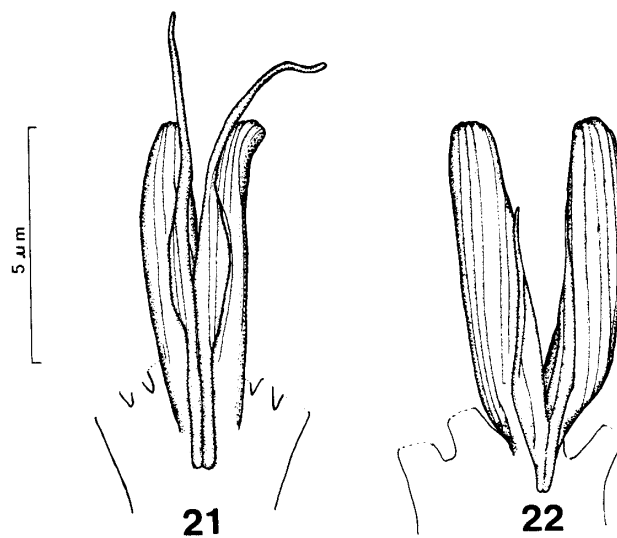
between their bases listed in Table 5. Genital flap and area anterior to flap transversely striate. Spinneret (terminal sensillum) on palpus conical in shape and about half to one third as long as wide. Numbers of setae and solenidia on leg segments presented in Table 6. Empodia composed of two simple claws (Fig. 22).

Male. Body size measurements shown in Table 4. Lengths of dorsal setae and distances between their bases as in Table 5. Aedeagus broadly curved dorsad. Numbers of setae and solenidia on leg segments presented in Table 6.

Type series. Holotype: Male, Oyafuru, Ishikari, Hokkaido, 8-IX-1989 (Y. SAITŌ), on *Sasa senanensis* (FRANCH. et SAV.). Paratypes: Twenty-two females and 1 male, Oyafuru, Ishikari, Hokkaido, 8-IX-1989 (YS), on *Sasa senanensis*, 1 female and 1 male, Oyafuru, Ishikari, Hokkaido, 1-V-1989 (YS), on *S. senanensis*, 1 female and 1 male, Kouchi-



Figs. 17–20. *Schizotetranychus longus* n. sp. 17: tarsus and tibia I of female, 18: tarsus and tibia II of female, 19: tarsus and tibia I of male, 20: tarsus and tibia II of male.



Figs. 21 and 22. 21: empodial claws of *Schizotetranychus miscanthi* n. sp., 22: empodial claws of *S. longus* n. sp. These figures were drawn on the basis of photographs taken with a scanning electron microscope (Hitachi, SEM S-2100A).

shi, Kouchi, 7-IV-1988 (YS), on *Sasa* sp.

Distribution. Hokkaido; Shikoku.

Remarks. EHARA (1957) compared, in detail, the Japanese form of *S. celarius* with the descriptions by BANKS (1917) and PRITCHARD and BAKER (1955). *S. longus* is very closely related to *S. celarius*, but differs as follows: The second propodosomal setae are as long as the distance between their bases in *longus*, while only two thirds as long as the distance in *celarius*. The second and third dorsocentral hysterosomal setae (C_2 , C_3) are much longer in *longus* than in *celarius*.

S. longus forms colonies on the underside of the leaves of *Sasa senanensis* and lives underneath a large dense web cover as well. *S. longus* was called the long seta form of *S. celarius* in SAITŌ (1986a, b, 1987 and 1990).

ACKNOWLEDGMENTS

I wish to express my appreciation to Professors S. EHARA, U. GERSON, Y. ITŌ, T. KUMATA, H. MATSUDA, H. MORI, M. SASAKAWA and S. TAKAGI for their criticisms and valuable suggestions. I also thank Dr. K. TAKAHASHI, Mr. Mh. OSAKABE and Ms. C. KUWABARA for their help and suggestions.

REFERENCES

- BANKS, N. (1917) New mites, mostly economic (Arach., Acar.). *Entomol. News* **28**: 193–199, pls. 14, 15.
- EHARA, S. (1957) On three spider mites *Schizotetranychus* from Japan. *J. Fac. Sci. Hokkaido Univ. Ser. 6 Zool.* **13**: 15–23.
- EHARA, S. (1989) Recent advances in taxonomy of Japanese tetranychoid mites. *Shokubutsu bōeki* **43**: 1–5 (in Japanese).
- EHARA, S. and THO, Y. P. (1988) Spider mites of the Malay Peninsula (Acarina: Tetranychidae). *J. Fac. Educ. Tottori Univ. Nat. Sci.* **37**: 1–24.
- SAITŌ, Y. (1986 a) Biparental defense in spider mite (Acari: Tetranychidae) infesting *Sasa* bamboo. *Behav. Ecol. Sociobiol.* **18**: 377–386.
- SAITŌ, Y. (1986 b) Prey kills predator: counter-attack success of a spider mite against its specific phytoseiid predator. *Exp. Appl. Acarol.* **2**: 47–62.
- SAITŌ, Y. (1987) Extraordinary effects of fertilization status on the reproduction of an arrhenotokous and sub-social spider mite (Acari, Tetranychidae). *Res. Popul. Ecol.* **29**: 57–71.
- SAITŌ, Y. (1990) Life history and food habit of *Typhlodromus bambusae* EHARA, a specific predator of *Schizotetranychus celarius* (BANKS) (Acari: Phytoseiidae, Tetranychidae). *Exp. Appl. Acarol.* (in press)
- SAITŌ, Y. and K. TAKAHASHI (1980) Study on variation of *Schizotetranychus celarius* (BANKS). I. Preliminary descriptions for morphological and life type variation. *Jap. J. appl. Ent. Zool.* **24**: 62–70 (in Japanese with English summary).
- SAITŌ, Y. and K. TAKAHASHI (1982) Study on variation of *Schizotetranychus celarius* (BANKS) II. Comparison of mode of life between two sympatric forms (Acarina: Tetranychidae). *Jpn. J. Ecol.* **32**: 69–78.
- PRITCHARD, A. E. and E. W. BAKER (1955) A revision of the spider mite family Tetranychidae. *Pacif. Coast Ent. Soc. Mem. Ser.* **2**: 1–472.