



**HAL**  
open science

# Schizotetranychus-like spider mites (Acari, Prostigmata, Tetranychidae) - revisited, new combinations and a key to groups of Schizotetranychus based on females

C.H.W. Flechtmann

## ► To cite this version:

C.H.W. Flechtmann. Schizotetranychus-like spider mites (Acari, Prostigmata, Tetranychidae) - revisited, new combinations and a key to groups of Schizotetranychus based on females. *Acarologia*, 2012, 52 (1), pp.87-95. 10.1051/acarologia/20122039 . hal-01566785

**HAL Id: hal-01566785**

**<https://hal.science/hal-01566785>**

Submitted on 21 Jul 2017

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution - NonCommercial - NoDerivatives 4.0 International License



# ACAROLOGIA

A quarterly journal of acarology, since 1959  
Publishing on all aspects of the Acari

All information:



<http://www1.montpellier.inra.fr/CBGP/acarologia/>  
[acarologia@supagro.inra.fr](mailto:acarologia@supagro.inra.fr)



**Acarologia is proudly non-profit,  
with no page charges and free open access**

Please help us maintain this system by  
**encouraging your institutes to subscribe to the print version of the journal**  
and by sending us your high quality research on the Acari.

**Subscriptions: Year 2017 (Volume 57): 380 €**

<http://www1.montpellier.inra.fr/CBGP/acarologia/subscribe.php>

Previous volumes (2010-2015): 250 € / year (4 issues)

Acarologia, CBGP, CS 30016, 34988 MONTFERRIER-sur-LEZ Cedex, France

The digitalization of Acarologia papers prior to 2000 was supported by Agropolis Fondation under the reference ID 1500-024 through the « Investissements d'avenir » programme (Labex Agro: ANR-10-LABX-0001-01)



**Acarologia** is under **free license** and distributed under the terms of the Creative Commons-BY-NC-ND which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original author and source are credited.

*SCHIZOTETRANYCHUS*-LIKE SPIDER MITES (ACARI, PROSTIGMATA,  
TETRANYCHIDAE) — REVISITED, NEW COMBINATIONS AND A KEY TO GROUPS  
OF *SCHIZOTETRANYCHUS* BASED ON FEMALES

Carlos H.W. FLECHTMANN

(Received 24 November 2011; accepted 13 February 2012; published online 30 March 2012)

CNPq-Brasil researcher, Universidade de São Paulo, Escola Superior de Agricultura "Luiz de Queiroz", Departamento de Entomologia e  
Acarologia, 13418-900 Piracicaba, São Paulo, Brasil. chwflech@esalq.usp.br

ABSTRACT — An overview of *Schizotetranychus*-like acarina is presented, with a key to the major groups of *Schizotetranychus* of the world, based on females. A probable remnant of the dorsal parts of the podal segments III and IV in *Stigmaeopsis* species is discussed. New combinations are proposed.

KEYWORDS — *Neonidulus*; *Schizotetranychus*; *Stigmaeopsis*; *Tribolonychus*; *Yezonychus*; *Yunonychus*; Tetranychidae

INTRODUCTION

The genus *Schizotetranychus* is one with the largest number of species, 115 (Migeon and Dorkeld, 2006-2011) of the family Tetranychidae. The identification of species in this genus has conventionally been based primarily on characters of the male aedeagus. Similarly as has been proposed for the species in the genus *Tetranychus* by Flechtmann and Knihinicki (2002) for cases where male specimens are not available or traditional characters such as the aedeagus shape are not reliable, an arbitrary key, based only on females, to the major groups of *Schizotetranychus* could help complement existing keys.

HISTORICAL REVIEW OF THE  
*Schizotetranychus*-LIKE GENERA

Trägårdh (1915), based on the shapes of the ambulacra of Tetranychidae with 7 setiform structures

on the palpal tarsus ("2 sensory cones, 2 straight pinshaped hairs, 3 ordinary hairs") and the presence of 10 pairs of dorsohysterosomal setae, until then placed in *Paratetranychus* Zacher and *Tetranychus* Dufour, divided this group creating two new genera, *Neotetranychus* and *Schizotetranychus*. For their recognition he proposed the following key:

Key to genera, (from Trägårdh, 1915)

1. Empodium shaped as a single claw ..... 2  
– Empodium divided into two or more prongs ... 3
2. Claw without any projection at the base...  
.....*Neotetranychus* nov. gen.  
– Empodium with projection near the base, bearing  
4-6 fine hairs ..... *Paratetranychus* Zacher
3. Claw bipartite ..... *Schizotetranychus* nov. gen.

– Claw divided into 4-6 prongs. *Tetranychus* Dufour

Ehara (1978) described a tetranychid genus *Yezonychus*, type *Y. sapporensis* Ehara, with the above characters of *Schizotetranychus* but which has no *f*<sub>2</sub> (outer sacral) setae, a pair of dorsohysterosomal setae present in *Schizotetranychus*. Its empodium is clawlike, split into two equal halves over about half of its length. This genus remains monotypic.

Ma and Gao (1985) described the genus *Yunonychus*, type *Y. daliensis* Ma and Gao, also with the above characters of *Schizotetranychus* but without setae *c*<sub>2</sub> (first pair of hysterosomal sub-lateral setae). This genus remains monotypic. Zhang and Martin (2001) erected the genus *Tribolonychus*, type *T. collyerae* Zhang and Martin, lacking setae *f*<sub>2</sub> (as in *Yezonychus*), but with a clawlike trifold empodium, that is, split into three prongs, two lateral, smaller, and one dorsomedian prong. This genus also remains monotypic.

Beard and Walter (2010) described *Neonidulus*, the fourth genus split off from *Schizotetranychus*, where setae *f*<sub>2</sub> are missing and with a clawlike empodium entirely (deeply) split into two clawlike structures, each with three prongs; the ventral prong on each pair much thicker than the two dorsal prongs. Type species *Schizotetranychus cornus* Pritchard and Baker, 1955. The authors also described one new species in this genus, *N. tereotus*, and transferred two species, formerly placed in *Yezonychus*, to this genus: *N. brevipilus* (Zhang and Martin, 2001) and *N. falsicornus* (Zhang and Martin, 2001).

The remaining species, with the characters mentioned in the first paragraph and presenting nine pairs of dorsal hysterosomal setae (*c* 1-2-3, *d* 1-2, *e* 1-2 and *f* 1-2) were left in the genus *Schizotetranychus* Trägårdh, 1915, type species *Tetranychus schizopus* Zacher, 1913. McGregor (1950) synonymized *Stigmaeopsis* Banks, 1917 (type species *S. celarius* Banks, 1917) under *Schizotetranychus*.

Saito *et al.* (2004) reinstated the genus *Stigmaeopsis* Banks based on the presence of only six setiform structures on the palp tarsus of females and males (2 simple setae, 3 eupathidia and one solenidion), while there are seven of these structures (three

simple setae + ...) in *Schizotetranychus*. The seven species now recognized as *Stigmaeopsis*, *S. celarius* Banks, *S. longus* (Saito, 1990), *S. miscanthi* (Saito, 1990), *S. nanjingensis* (Ma and Yuan, 1980), *S. tenuinidus* (Zhang and Zhang, 2000), *S. saharai* Saito and Mori, 2004 and *S. takahashi* Saito and Mori, 2004 are also characterized by the position of the dorsocentral hysterosomal setae: the bases of the pairs of setae *e*<sub>1</sub>, *d*<sub>1</sub> and *c*<sub>1</sub> are progressively wider apart than the bases of *f*<sub>1</sub> setae, that is, hypothetical lines connecting their bases form a V shaped pattern (these lines are parallel in the other Tetranychini, including *Schizotetranychus*), as pointed out by Saito *et al.* (2004). Another striking feature exhibited by the *Stigmaeopsis* species is the dorsal integumental trapezoidal area between the pairs of setae *c*<sub>1</sub>, *d*<sub>1</sub> and *e*<sub>1</sub>. Anteriorly this area is well set off from the propodosoma dorsum by the sejugal furrow; laterally there seems to be no well pronounced furrows or deep markings and posteriorly, at least in *S. celarius*, *S. saharai*, *S. takahashii* there seems to occur another, although short, transverse furrow. The exact nature of these lateral and posterior limits should be examined in specimens not flattened by the weight of the coverslip. This trapezoidal area is clearly longitudinally striated, the striae restricted to this area, while the lateral adjacent areas, bearing the dorsohysterosomal setae, although mainly longitudinally striated, their striae bend anteriorly outwards and posteriorly around the central trapezoidal area. Could this trapezoidal area represent a remnant of the dorsal part of the podal segments of legs III and IV?

*Schizotetranychus malkovskii* (Wainstein, 1956) and *S. meghalensis* Gupta and Gupta, 1994 also exhibit the aforementioned characters (six setiform structures on palp tarsus and the trapezoidal dorsohysterosomal area), therefore, the new combinations

- *Stigmaeopsis malkovskii* (Wainstein, 1956) **n. comb.**, and
- *Stigmaeopsis meghalensis* (Gupta and Gupta, 1994) **n. comb.**

are proposed.

KEYS TO GROUPS OF SPECIES IN THE  
GENUS *Schizotetranychus*, BASED ON  
FEMALES

The key to the major groups of *Schizotetranychus* is based on females only. Since the character length of dorsocentral setae may be somewhat variable, not to say, not absolutely reliable when in the presence of only one specimen, several individuals should be examined. This should not pose a serious problem, since these mites are generally found in groups of specimens under the webbing. Seventeen groups are proposed, but these do not necessarily have phylogenetic significance.

1. Idiosoma elongate – body length (not including rostrum): width = or > 2 ..... 2  
— Idiosoma orbicular or more or less oval: length : width < 2 ..... 5
2. Dorsocentral hysterosomal setae (*c1*, *d1*, *e1*) shorter than longitudinal distances between consecutive setae ..... 3  
— Dorsocentral hysterosomal setae (*c1*, *d1*, *e1*) equal to or longer than longitudinal distance to seta next behind ..... group 1
3. Peritremes straight, ending in a bulb (expanded distally) ..... group 2  
— Peritremes ending in a hook or in a loop ..... 4
4. Peritremes ending in a hook ..... group 3  
— Peritremes looped distally ..... *S. nugax*
5. Female idiosoma orbicular, approximately as wide as long ..... group 4  
- Female idiosoma more or less oval, longer than wide ..... 6
6. Dorsal integument reticulated in females (striated in males) ..... group 5  
— Females and males with dorsal integument striate ..... 7
7. Length of dorsohysterosomal setae (*c1*, *d1*, *e1*) shorter or approximately equal (rarely slightly

- longer) to longitudinal distance to bases of consecutive pair of setae (In *S. graminicola* Goux *d1* is the only dorsohysterosomal seta longer than distance to consecutive seta) ..... 8  
— Dorsocentral hysterosomal setae (at least *d1* and *e1*) longer than longitudinal distance to basis of consecutive seta ..... 13
8. Dorsocentral hysterosomal setae shorter than interval to base of seta next behind ..... 9  
— Dorsocentral hysterosomal setae about as long as longitudinal interval to base of seta next behind ..... 10
9. Dorsal hysterosomal setae (most of them) awl shaped, acutely tapering from the widened proximal (basal) portion ..... group 6  
— Dorsal hysterosomal setae setose ..... group 7
10. Tibia of leg I of female with 7 tactile and 1 sensory setae ..... group 8  
— Tibia of leg I of female with 8 - 10 tactile plus one sensory setae ..... 11
11. Tibia of leg I of female with 8 tactile plus one sensory setae ..... group 9  
— Tibia of leg I of female with 9 - 10 tactile plus one sensory setae ..... 12
12. Tibia of leg I of female with 9 tactile plus one sensory setae ..... group 10  
— Tibia of leg I of female with 10 tactile plus one sensory setae ..... group 11
13. Dorsocentral hysterosomal setae *d1* and *e1* longer and *c1* shorter or about equal in length than interval to base of next seta behind ..... group 12  
— Dorsocentral hysterosomal setae *c1*, *d1* and *e1* longer than interval to base of seta next behind .. 14
14. Dorsocentral hysterosomal setae (at least *c1* and *d1*) very long, reaching past second seta caudad, or, when about equal to this length then these setae are longer than the remaining hysterosomal setae except *c3* ..... group 13  
— Dorsocentral hysterosomal setae reaching past first seta behind but not reaching second seta be-

hind ..... 15

15. Tibia of leg I of female with 6 tactile and one sensory setae ..... group 14  
— Tibia of leg I of female with more than 6 tactile setae ..... 16

16. Tibia of leg I of female with 7 tactile and one sensory setae ..... group 15  
— Tibia of leg I of female with more than 7 tactile setae ..... 17

17. Tibia of leg I of female with 8 tactile and sensory setae ..... group 16  
— Tibia of leg I of female with 9 tactile and sensory setae ..... group 17

**Group 1**

- *S. elongatus* Wang and Cui, 1991
- *S. imperatae* Wang, 1983
- *S. kochummeni* Ehara, 1988
- *S. minutus* Wang and Zhang, 1985
- *S. paezi* Alvarado and Freitez, 1976
- *S. taquarae* Paschoal, 1971

**Group 2**

- *S. boutelouae* Tuttle and Baker, 1968
- *S. lycurus* Tuttle and Baker, 1964
- *S. rhodanus* Baker and Pritchard, 1960

**Group 3**

- *S. fluvialis* McGregor, 1928
- *S. freitezi* Ochoa, Gray and von Lindeman, 1990
- *S. oryzae* Rossi de Simons, 1966
- *S. vermiculatus* Ehara and Wongsiri, 1975

**Group 4**

- *S. brevisetosus* Ehara, 1989
- *S. kaspari* Manson, 1967
- *S. sayedi* Attiah, 1967

**Group 5**

- *S. luculentus* Tseng, 1990
- *S. reticulatus* Baker and Pritchard, 1960

**Group 6**

- *S. baltazarae* Rimando, 1962
- *S. gausus* Baker and Pritchard, 1960
- *S. hidayahae* Yusof and Zhang, 2003
- *S. sacrales* Baker and Pritchard, 1960
- *S. sagatus* Davis, 1969
- *S. spiculus* Baker and Pritchard, 1960
- *S. spireaefolia* Garman, 1940

**Group 7**

- *S. agropyron* Tuttle and Baker, 1976
- *S. asparagi* (Oudemans, 1928)
- *S. avetjanae* Bagdasarian, 1954
- *S. celtidis* Tuttle and Baker, 1968
- *S. denmarki* Baker and Tuttle, 1994
- *S. echinulatus* Mitrofanov, 1978
- *S. floridensis* (McGregor, 1930)
- *S. gilvov* Ehara and Ohashi, 2005
- *S. guatemalae-novae* (Stoll, 1886)
- *S. hindustanicus* (Hirst, 1924)
- *S. montanae* Tuttle and Baker, 1968
- *S. pennamontanus* Meyer, 1987
- *S. pomeranzevi* Reck, 1956
- *S. prosopis* Tuttle, Baker and Abbatiello, 1976 \*
- *S. protectus* Meyer, 1965

- *S. pseudolycurus* Ochoa, Gray and von Lindeman, 1990
- *S. saba-sulchani* Reck, 1956
- *S. shii* (Ehara, 1965)
- *S. umtaliensis* Meyer, 1974

\* *S. prosopis* is, so far, the only *Schizotetranychus* species with the distal ending of the peritremes anastomosing.

#### Group 8

- *S. andropogoni* (Hirst, 1926)
- *S. camur* Pritchard and Baker, 1955
- *S. paraelymus* Feres and Flechtmann, 1995
- *S. undulatus* (Beer and Lang, 1958)
- *S. youngi* Tseng, 1975

#### Group 9

- *S. dalbergiae* Meyer, 1974
- *S. yoshimeki* Ehara and Wongsiri, 1975

#### Group 10

- *S. australis* Gutierrez, 1968
- *S. colocasiae* Ehara, 1988
- *S. fauveli* Gutierrez, 1978
- *S. leguminosus* Ehara, 1973 \*
- *S. lespedezae* Beglyarov and Mitrofanov, 1973
- *S. lushanensis* Wang, 1994

*S. leguminosus* is probably a junior synonym of *S. lespedezae*.

#### Group 11

- *S. garmani* Pritchard and Baker, 1955
- *S. levinensis* Manson, 1967

#### Group 12

- *S. eremophilus* McGregor, 1950
- *S. russeus* Davis, 1969

#### Group 13

- *S. gahniae* Davis, 1969
- *S. laevidorsatus* Ehara, 1988
- *S. longirostris* Feres and Flechtmann, 1995
- *S. parasemus* Pritchard and Baker, 1955
- *S. sacharum* Flechtmann and Baker, 1975
- *S. saitoi* Ehara, 1988

#### Group 14

- *S. approximatus* Ehara, 1988
- *S. papillatus* Flechtmann, 1995
- *S. triquetrus* Meyer, 1987
- *S. indicus* Gupta and Gupta, 1994 \*

\* The authors inform that the tibia of leg I of female has 6 tactile plus 3 sensory setae; however, their drawing suggests 8 tactile + 1 sensory setae.

#### Group 15

- *S. arcuatus* Meyer, 1974
- *S. cajani* Gupta, 1976
- *S. filifolius* Mweyer, 1974
- *S. recki* Ehara, 1957
- *S. rhynosperus* Flechtmann and Baker, 1970
- *S. schizopus* (Zacher, 1913) \*

\* There is a report by Ehara (1957) of *S. schizopus* with 8 and 9 tactile setae on tibia I of female.

### Group 16

- *S. cynodonis* McGregor, 1950
- *S. elymus* McGregor, 1950
- *S. hilariae* Tuttle and Baker, 1968
- *S. lanyuensis* Tseng, 1975\*
- *S. masoni* Gupta, 1980
- *S. miyatahus* Meyer, 1974
- *S. nesbitti* Meyer, 1965
- *S. tbilisiensis* Reck, 1959
- *S. tumidus* Wang, 1981
- *S. tuttleii* Zaher, Gomaa and El-Enany, 1982

\* There is a discrepancy between the text, informing 8 + 1 setae and the drawing, showing 6 + 1 setae on tibia of leg I of female.

### Group 17

- *S. alni* Beglyarov and Mitrofanov, 1973
- *S. bambusae* Reck, 1941
- *S. beckeri* Wainstein, 1958
- *S. bhandhufalcki* Ehara and Wongsiri, 1975
- *S. brachypodii* Livshitz and Mitrofanov, 1968
- *S. cercidiphilly* Ehara, 1973
- *S. chiangmaiensis* Ehara and Wongsiri, 1975
- *S. euphorbiae* Livshitz and Mitrofanov, 1968
- *S. floresi* Rimando, 1962
- *S. halimodendri* Wainstein, 1958
- *S. lechrius* Rimando, 1962
- *S. malayanus* Ehara, 1988 \*
- *S. smirnovi* Wainstein, 1954
- *S. tephrosiae* Gutierrez, 1968
- *S. textor* Wainstein, 1954

- *S. tuminicus* Ma and Yuan, 1982
- *S. ugarovi* Wainstein, 1960
- *S. zhangii* Wang and Cui, 1992
- *S. zhongdianensis* Wang and Cui, 1992

\* There is a report by Ehara, 2004 on *S. malayanus* females with 9 tactile plus 3 and 4 sensory setae on tibia of leg I. In *S. kreiteri* the tibia of leg I of female has 9 tactile plus 3 sensory setae.

Due to insufficient data provided in their descriptions the following species could not be affiliated to any of the above groups:

- *S. setariae* Meyer, 1987 — only known from the male.
- *S. emeiensis* Wang, 1983 female has nine tactile and two sensory setae on tibia of leg I ; otherwise it would fit into group 17.
- *S. tuberculatus* (Ugarov and Nikolski, 1937) — is the only species where the dorsal setae are set on tubercles.
- *S. jachontovi* Reck, 1953 belongs to one of the groups in between 14 and 17; no information on the number of tibial setae is given in its description.
- The descriptions of *S. glabrisetus* Ugarov and Nikolski, 1937 and *S. oudemansi* Reck, 1948 were not seen.

### ACKNOWLEDGEMENTS

Heartiest thanks to three anonymous referees who, in carefully reading through the text, corrected a few of my mistakes and especially to Alain Migeon for rearranging the introduction, rendering it more reader friendly and better stressing the aim of this paper.




## REFERENCES

- Alvarado D.G., Fréitez R. F. 1976 — *Schizotetranychus paezi* sp.n. y *S. oryzae* (Acarina: Tetranychidae) atacando arroz em Venezuela — *Agronomia Tropical*, 26(2): 159-165.
- Attiah H.H. 1967 — Two new species of mites on figs, from Egypt. (Acarina) — *Bull. Soc. Entomol. Egypte*, 51(1): 1-5.
- Bagdasarian A.T. 1954 — New species of tetranychid mites from Armenia (in Russian) — *Dokl. Akad. Nauk. Arm. S.S.R.*, 18(2): 51-56.
- Baker E.W., Pritchard A.E. 1960 — The Tetranychoid mites of Africa — *Hilgardia*, 29(11): 455-574.
- Baker E.W., Tuttle D.M. 1994 — A guide to the spider mites (Tetranychidae) of the United States — Indira Publishing House, Michigan, 347 p.
- Banks N. 1917 — New mites, mostly economic. (Arachn., Acar.) — *Entomological News*, 28: 193-199.
- Beard J., Walter D.E. 2010 — New spider mite genus (Prostigmata: Tetranychidae) from Australia and New Zealand, with a discussion of *Yezonychus* Ehara — *Zootaxa*, 2578: 1-24.
- Bear R.E., Lang D.S. 1958 — The Tetranychidae of Mexico (Acarina) — *The University of Kansas Science Bulletin*, 38 Pt. II (15): 1231-1259.
- Beglyarov G.A., Mitrofanov V.I. 1973 - Nouvelles espèces du genre *Schizotetranychus* de la région de Vladivostok. (in Russian) — *Biol. Rev.*, 6: 16-22.
- Davis J.J. 1969 — A new species of *Schizotetranychus* (Acarina: Tetranychidae) from Queensland — *J. Australian Entomol. Soc.*, 8: 107-109. doi:10.1111/j.1440-6055.1969.tb00737.x
- Ehara S. 1957 — On three spider mites of *Schizotetranychus* from Japan — *Jour. Fac. Sci. Hokkaido Univ., Ser. VI, Zool.*, 13: 15-23 (Prof. T. Uchida Jubilee Volume).
- Ehara S. 1965 — Two new species of *Eotetranychus* from Shikoku, with notes on *E. kankitus* Ehara (Acarina: Tetranychidae) — *Journal of the Faculty of Science, Hokkaido University, Series VI, Zoology*, 15 (4): 618-624.
- Ehara S. 1973 — Three species of the genus *Schizotetranychus* (Acarina, Tetranychidae) — *Annotationes Zoologicae Japonenses*, 46(4): 224-232.
- Ehara S. 1978 — A new genus and a new sub-genus of spider mites from northern Japan (Acarina: Tetranychidae) — *The Journal of the Faculty of Education, Tottori University, Natural Science*, 28(2): 87-93.
- Ehara S. 1989 — Four new species of spider mites (Acarina: Tetranychidae) from Japan. *Proceedings of the Japanese Society of Systematic Zoology*, 40: 28-38.
- Ehara S. 2004 — A collection of spider mites (Arachnida: Acari: Tetranychidae) from Sumatra — *Species Diversity*, 9(1): 67-76.
- Ehara S., Ohashi K. 2005 — A new spider mite species of *Schizotetranychus* (Acari: Prostigmata: Tetranychidae) from *Quercus gilva* in Japan — *Zootaxa*, 884: 1-5.
- Ehara S., Tho Y.P. 1988 — Spider mites of the Malay Peninsula (Acarina: Tetranychidae) — *The Journal of the Faculty of Education, Tottori University, Natural Science*, 37(1): 1-24.
- Ehara S., Wongsiri T. 1975 — The spider mites of Thailand (Acarina: Tetranychidae) — *Mushi, Fukuoka Entomological Society*, 48(13): 149-185.
- Feres R.J.F., Flechtmann C.H.W. 1995 — Mites (Acari) associated with bamboo (*Bambusa* sp., Poaceae) in a woody area from northwestern São Paulo State, Brazil — *Revista Brasileira de Zoologia*, 12(3): 533-546. doi:10.1590/S0101-81751995000300008
- Flechtmann, C.H.W. 1995 — On the mite fauna of bamboo leaves in the Parque Nacional do Itatiaia, Rio de Janeiro, Brazil — *Internat. J. Acarol.*, 21(4): 243-252. doi:10.1080/01647959508684067
- Flechtmann C.H.W., Baker E.W. 1970 — A preliminary report on the Tetranychidae (Acarina) of Brazil — *Ann. Entomol. Soc. America*, 63(1): 156-63.
- Flechtmann C.H.W., Baker E.W. 1975 — A report on the Tetranychidae (Acari) of Brazil — *Revista Brasileira de Entomologia*, 19 (3): 111-122.
- Flechtmann C.H.W., Knihinicki D.K. 2002 — New species and new records of *Tetranychus* Dufour from Australia, with a key to the major groups in this genus based on females (Acari: Prostigmata: Tetranychidae) — *Australian J. Entomol.*, 41: 118-127. doi:10.1046/j.1440-6055.2002.00289.x
- Flechtmann C.H.W., Kreiter S., Etienne J., de Moraes G.J. 1999 — Plant mites (Acari) of the French Antilles. I. Tetranychoida (Prostigmata) — *Acarologia*, 40(2): 137-144.
- Garman P. 1940 — Tetranychidae of Connecticut — *Connecticut Agricultural Experiment Station, Bulletin*, 431: 67-87.
- Goux L., 1949 — Etude d'un *Schizotetranychus* nouveau de la région Lyonnaise (Acar. Tetranychidae) — *Bull. Soc. Linn. Lyon*, 18(6): 100-104.
- Gupta S.K. 1976 — Contribution to our knowledge of tetranychid mites (Acarina) with descriptions of three new species from India — *Oriental Insects*, 10(3): 327-351.
- Gupta S.K., Gupta Y.N. 1994 — A taxonomic review of Indian Tetranychidae (Acari: Prostigmata) with descriptions of new species, re-descriptions of known species

- and keys to genera and species. Genus 17. *Schizotetranychus* Trägårdh — Mem. Zool. Survey of India, 18(1): 86-99.
- Gupta Y.N. 1980 — Some spider mites (Acarina: Tetranychidae) from Andaman and Nicobar Islands with descriptions of three new species — Rec. Zool. Survey of India, 77: 111-117.
- Gutierrez J. 1968 — Tetranychidae nouveaux de Madagascar (Quatrième note) — Acarologia, 10(1): 13-28.
- Gutierrez J. 1978 — Cinq nouvelles espèces de Tetranychidae (Acariens) de Nouvelle-Calédonie — Acarologia, 20(3): 351-364.
- Hirst S. 1924 — On some new species of red spider — Annals and Magazine of Natural History, Ser. 9, 14: 522-527 + 2 pl.
- Hirst S. 1926 — Descriptions of new mites, including four new species of "red spider" — Proc. Zool. Soc. London, 1926, Part 3: 825-841.
- Livshitz I.Z., Mitrofanov V.I. 1968 - New species of red and false spider mites (Acarina, Tetranychidae) from the Crimea. (in Russian) — Rev. Entomol URSS, 47(3):671-682.
- Ma E.-P., Gao J.-R. 1985 — A new genus and species of Tetranychidae from China — Acta Entomol. Sinica, 28(2): 201-203.
- Ma E.-P., Yuan Y.L. 1980 — New species and new records of Tetranychid mites from China. I — Acta Zootaxonomica Sinica, 5(1): 42-45.
- Ma E.-P., Yuan Y.L. 1982 — A new genus and five new species of Tetranychidae from China (Acari: Tetranychidae) — Entomotaxonomia, 4(1-2): 109-114.
- Manson D.C.M. 1967 — The spider mite family Tetranychidae in New Zealand. III. The genus *Schizotetranychus* — Acarologia, 9(4): 823-840.
- McGregor A.E. 1928 — Descriptions of two new species of spinning mites — Proc. Ent. Soc. Wash., 30(1): 11-15.
- McGregor A.E. 1930 — A new spinning mite attacking *Asparagus plumosus* in Florida — Proc. Ent. Soc. Wash., 32(9): 161-163.
- McGregor A.E. 1950 — Mites of the family Tetranychidae — The American Midland Naturalist, 44(2): 257-420. doi:10.2307/2421963
- Meyer M.K.P. 1965 — South African Acarina I. Nine species of the sub-family Tetranychinae collected on wild plants — Koedoe, 8: 82-94 + 6 pl.
- Meyer M.K.P. 1974 — A revision of the Tetranychidae of Africa (Acari) with a key to the genera of the world — Republic of South Africa Department of Agricultural Technical Services, Plant Protection Research Institute, Pretoria, Entomology Memoir No. 36, 291 p.
- Meyer M.K.P. 1987 — African Tetranychidae (Acari: Prostigmata), with reference to the world genera — Republic of South Africa Department of Agriculture and Water Supply, Entomology Memoir No. 69, 175 p.
- Migeon A. And Dorkeld F. 2006-2011 — Spider Mites Web: a comprehensive database for the Tetranychidae — <http://www.montpellier.inra.fr/CBGP/spmweb>
- Mitrofanov V.I. 1978 — New species of *Schizotetranychus* mites (Acarina, Tetranychidae) from the Crimea — Nauch. Dokl. Vyssh. Shk. Biol. Nauki, 6: 44-47.
- Ochoa R., Gray B., von Lindeman G. 1990 — El género *Schizotetranychus* Trägårdh (Acari: Tetranychidae) en Costa Rica y Panamá — Turrialba, 40(2): 210-216.
- Oudemans A.C. 1928 — Acarologische Aanteekeningen LXXXIX — Entomologische Berichte, 7(159): 285-293.
- Paschoal A.D. 1971 — A new *Schizotetranychus* from the Brazilian fauna (Acarina: Tetranychidae) — Revista Peruana de Entomologia, Annales del Primer Congreso Latinoamericano de Entomologia, Cusco, Peru (12-18 Abril 1971), 14(1): 172-173.
- Pritchard A.E., Baker E.W. 1955 — A revision of the spider mite family Tetranychidae — Pacific Coast Entomological Society, Memoir Series Vol. 2, 472 p.
- Reck, H. [sic] 1941 — Eine neue *Schizotetranychus*-Art (Tetranychida, Acari) — Soobsh. Akad. Nauk Gruz. S.S.R., 2(5): 449-452.
- Reck G.F. 1947 — New species of spider mites from Gruzii. [in Russian] — Soobsh. Akad. Nauk Gruz. S.S.R., 8(7): 471-475.
- Reck G.F. 1948 — Rod *Schizotetranychus* (Tetranychidae, Acari) po materialam iz Gruzii — Sobosh. Akad. Nauk Gruz. S.S.R., 9(6): 369-376.
- Reck G.F. 1953 — Research investigation on the fauna of the Tetranychidae in Georgia [in Russian] — Tr. Inst. Zool. Akad. Nauk Gruz S.S.R., 11: 161-181.
- Reck G.F. 1956 — Novye vidy tetranihovykh klescej iz Vostocnoj Gruzii — Tr. Inst. Zool. Akad. Nauk Gruz S.S.R., 15: 5-28.
- Reck G.F. 1959 — A key to the tetranychoid mites — Fauna Trans Caucasia Akad. Nauk. Gruz. S.S.R., 1: 1-152. (not seen)
- Rimando L.C. 1962 — Four new species of spider mites of the genera *Eotetranychus* and *Schizotetranychus* (Tetranychidae, Acarina) — The Philippine Agriculturist, 14(10): 535-544.
- Rimando L.C. 1962 — The Tetranychoid mites of the Philippines — The University of the Philippines, College of Agriculture, Technical Bulletin 11, 52 p.
- Rossi de Simons N.H. 1966 — Descripción de *Schizotetranychus oryzae* sp.n. (Acari — Tetranychidae) — Revista de Investigaciones Agropecuarias, INTA, Buenos Aires, Ser. 5, Patologia Vegetal, 3(1): 1-10.

- Saito Y. 1990 — Two new spider mite species of the *Schizotetranychus celarius* complex (Acari: Tetranychidae) — *Appl. Ent. Zool.*, 25(3): 389-396.
- Saito Y., Mori K., Sakagami T., Lin J. 2004 — Reinstatement of the genus *Stigmaeopsis* Banks, with descriptions of two new species (Acari, Tetranychidae) — *Ann. Entomol. Soc. America*, 97(4): 635-646. doi:10.1603/0013-8746(2004)097[0635:ROTGSB]2.0.CO;2
- Stoll O. 1886 — *Biologia Centrali-Americana. Arachnida Acaridea*. 53 p, 21 pl.
- Trägårdh I. 1915 — Bidrag till Kännedomen om Spinnkvalstren (*Tetranychus* Duf.). Meddelande Nr. 109 fran Centralanstalten för försöksväsendet pa Jordbruksomradet — *Entomologiska avdelningen*, 20: 1-59.
- Tseng Y.-H. 1975 — Systematics and distribution on the phytophagous mites of Taiwan. Part I. A revision of the mites family Tetranychidae, with an illustration key to genera of the world — B.C.I.Q. Ministry of Economic Affairs, Plant Quar. Bull., 10: 1-132. (not seen)
- Tseng Y.-H. 1990 — A monograph of the mite family Tetranychidae (Acarina: Trombidiformes) from Taiwan — Taiwan Museum Special Publication Series Number 9, 124 p.
- Tuttle D.M., Baker E.W. 1968 — Spider mites of Southwestern United States with a revision of the family Tetranychidae — University of Arizona Press, 143 p.
- Tuttle D.M., Baker E.W. 1976 — New records and species of Tetranychidae and Tenuipalpidae (Acarina) from Utah and Idaho — *Great Basin Naturalist*, 36(1): 57-64.
- Tuttle D.M., Baker E.W. 1964 — The spider mites of Arizona (Acarina: Tetranychidae) — U.S. Dep. Agriculture, Agricultural Research Service, Entomology Research Division, Technical Bulletin, 158: 1-41.
- Tuttle D.M., Baker E.W., Abbatiello M.J. 1976 — Spider mites of Mexico (Acari: Tetranychidae) — *Internat. J. Acarol.*, 2(2): 1-102. doi:10.1080/01647957608683760
- Ugarov A.A., Nikolskii V.V. 1937 — Systematic study of spider mites from Central Asia — *Tr. Sredne-Aziat. Stn. Zashch. Rast.*, 2: 26-64.
- Wainstein B.A. 1954 — Fauna of spider mites injurious to orchards in South Kazakhstan — *Zool. Zh.*, 33(3): 561-564.
- Wainstein B.A. 1956 — Material on the fauna of tetranychid mites of Kazakhstan. — *Tr. Resp. St. Zashch. Rast. Kazifilial Vaskhnil*, 3: 70-83.
- Wainstein B.A. 1958 — A contribution to the knowledge of the fauna and the taxonomy of spider mites (Acariformes, Tetranychoida) — *Rev. Entomol. URSS*, 37(2): 455-459.
- Wainstein B.A. 1960 — Tetranychoid mites of Kazakhstan (with revision of the family) — *Kazakh. Akad. Sel'sk. Nauk. Nauch.-Issled. Inst. Zash. Rast. Trudy*, 5: 1-276. (In Russian).
- Wang H.-F. 1981 — *Schizotetranychus* from China with a new species (Acarina: Tetranychidae) — *Sinozoologia*, 1(1): 113-116.
- Wang H.-F. 1983 — Two new species of the genus *Schizotetranychus* from Sichuan (Acarina: Tetranychidae) — *Acta Zootaxonomica Sinica*, 8(3): 262-266.
- Wang D. 1994 — *Schizotetranychus lushanensis*, a new pest on camphor trees from east China (Acarina: Tetranychidae) — *J. of Shanghai Agricultural College*, 12(3): 215-217.
- Wang H.-F., Cui Y.-Q. 1991 — Three new species of Tetranychidae from the Hengduan Mountains, China (Acari: Tetranychidae) — *Acta Zootaxonomica Sinica*, 16(3): 304-312.
- Wang H.-F., Cui Y.-Q. 1992 — Acari: Tetranychoida — Insects of the Hengduan Mountains Region, 2: 1431-1440.
- Wang H.-F., Zhang X.-M. 1985 — A preliminary survey of Tetranychid mites in Fujian with description of a new species (Acariformes: Tetranychoida) — *Wuyi Science Journal*, 5: 89-93.
- Yusof O., Zhang Z.-Q. 2003 — Tetranychidae (Acari: Prostigmata) of Malay Peninsula; checklist, key to genera and species and description of three new species — *Systematic Appl. Acarol.*, 8: 149-173.
- Zacher F. 1913 — Untersuchungen über Spinnmilben — *Mitt. Kaiserlichen Biol. Anstalt für Land- und Forstwirtschaft*, 14: 37-41.
- Zaher M.A., Gomaa E.A., El-Enany M.A. 1982 — Spider mites of Egypt (Acari: Tetranychidae) — *Internat. J. Acarol.*, 8(2): 91-114. doi:10.1080/01647958208683284
- Zhang Z.-Q., Martin N.A. 2001 — A review of *Schizotetranychus*-like mites (Acari: Tetranychidae) from New Zealand — *J. Royal Soc. New Zealand*, 31(2): 307-325. doi:10.1080/03014223.2001.9517656
- Zhang Z.-Q., Zhang Y., J. Lin J. 2000 — Mites of *Schizotetranychus* (Acari: Tetranychidae) from moso bamboo in Fujian, China — *Systematic Appl. Acarol. Special Publication*, 4: 19-35.

## COPYRIGHT

 Flechtmann C. H. W. Acarologia is under free license. This open-access article is distributed under the terms of the Creative Commons-BY-NC-ND which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original author and source are credited.