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

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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; Yunonymchus; 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.

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.
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) reinstituted 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 c1, d1 and c1 are progressively wider apart than the bases of f1 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 c1, d1 and c1. 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. takahashi* 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 dorsal hysterosomal 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 (*c*1, *d*1, *e*1) shorter than longitudinal distances between consecutive setae ........................................ 3
   - Dorsocentral hysterosomal setae (*c*1, *d*1, *e*1) 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 (*c*1, *d*1, *e*1) shorter or approximately equal (rarely slightly longer) to longitudinal distance to bases of consecutive pair of setae (In *S. graminicola* Goux *d*1 is the only dorsohysterosomal seta longer than distance to consecutive seta) ............................. 8
   - Dorsohysterosomal setae (at least *d*1 and *e*1) longer than longitudinal distance to basis of consecutive seta ........................................ 13

8. Dorsohysterosomal setae shorter than interval to base of seta next behind ............... 9
   - Dorsohysterosomal 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 ................................ 11

13. Dorsocentral hysterosomal setae *d*1 and *e*1 longer and *c*1 shorter or about equal in length than interval to base of next seta behind ........... 12
    - Dorsohysterosomal setae *c*1, *d*1 and *e*1 longer than interval to base of seta next behind ..14

14. Dorsohysterosomal setae (at least *c*1 and *d*1) very long, reaching past second seta caudal, or, when about equal to this length then these setae are longer than the remaining hysterosomal setae except *c*3 ........................................ group 13
    - Dorsohysterosomal setae reaching past first seta behind but not reaching second seta be-
| Group 1 | Group 2 | Group 3 |
|--------|--------|--------|
| S. elongatus Wang and Cui, 1991 | S. boutelouae Tuttle and Baker, 1968 | S. fluvialis McGregor, 1928 |
| S. imperatae Wang, 1983 | S. lycurus Tuttle and Baker, 1964 | S. freitezi Ochoa, Gray and von Lindeman, 1990 |
| S. kochummeni Ehara, 1988 | S. rhodanus Baker and Pritchard, 1960 | S. oryzae Rossi de Simons, 1966 |
| S. minutus Wang and Zhang, 1985 | | S. vermiculatus Ehara and Wongsiri, 1975 |
| S. paezi Alvarado and Freitez, 1976 | | |
| S. taquarae Paschoal, 1971 | | |

**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. spireafolia 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. gilvus 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 Linde-
man, 1990
– *S. saba-sulchani* Reck, 1956
– *S. shii* (Ehara, 1965)
– *S. umtaliensis* Meyer, 1974

* S. *prosopis* is, so far, the only *Schizotetrany-
chus* 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. cremophilus* 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. mansoni* 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. zhangi* 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. eneensis* 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.

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