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Previous volumes (2010-2021): 250 € / year (4 issues)
Acarologia, CBGP, CS 30016, 34988 MONTFERRIER-sur-LEZ Cedex, France
ISSN 0044-586X (print), ISSN 2107-7207 (electronic)

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)

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TWO NEW EYELESS MITE SPECIES FROM THE WESTERN PROVINCES OF IRAN: 
STIGMAEUS LADANAE N. SP. AND STIGMAEUS NASRINAE N. SP. 
(ACARI: STIGMAEIDAE)

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(Received 29 February 2012; accepted 27 March 2012; published online 22 June 2012)

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ABSTRACT — Two new species of the genus Stigmaeus, S. ladanae n. sp., collected from soil under apple trees in Abbas Abad Hamedan, Hamedan province and S. nasrinae n. sp., collected from soil under Apera spica-venti (L.) (Poaceae) in Nahavand, Hamedan province, Iran, are described and illustrated.

KEYWORDS — Raphignathoidea; Walnut; first record; predatory mites; Iran

INTRODUCTION

The members of the family Stigmaeidae are found throughout the world and some of them can feed on the eggs and immature stages of spider mites, eriophyid mites and also immature stages of scale (White and Laing, 1977; Santos and Laing, 1985; Khanjani et al., 2010). They are found abundantly on the trees bark, on or in soil, grass, leaf, mulch, lichen, wood boring beetles, crevices in rock and leaf cavities, and a few of them are parasitic on phlebotomine flies (Dönel and Doğan, 2011). The family Stigmaeidae consists of 32 valid genera and about 500 species so far (Doğan et al., 2011). Fourteen species of the genus Stigmaeus have been reported from Iran, namely: S. alvandis Khanjani and Ueckermann, 2002; S. unicus Kuznezov, 1977; S. elongatus Berlese, 1886; S. candidus Fan and Li, 1993 (= S. mazandaranicus Faraji and Ueckermann, 2006); S. malekii Haddad et al., 2006; S. pilatus Kuznetzov, 1987; S. shabestariensis Haddad et al., 2010a; S. shendabadiensis Haddad et al., 2010b; S. boshroyehensis, Khanjani et al., 2010; S. marandiensis Bagheri et al., 2011; S. uckermannii Pahlavan Yali et al., 2011; S. longipilis Canestrini, 1889; S. planus Kuznetzov (Doğan et al., 2012), S. sphagneti (Hull, 1918): In this paper S. ladanae n. sp. and S. nasrinae n. sp. are described and illustrated from Iran.

MATERIALS AND METHODS

Mites were collected from soil beneath Apera spica-venti (L.) (Poaceae) in Nahavand, and soil under apple trees in Abbas Abad, Hamedan, Hamedan province and mounted directly in Hoyer’s medium (Krantz and Walter, 2009). The specimens were measured, identified and drawn by means of differential interference contrast microscopy 1000X mag-
Figure 1: Stigmaeus ladanae n. sp. (female): A – Dorsum; B – Venter; C – Gnathosoma.
Plant Protection Research, Pretoria, South Africa.

Acarology Laboratory, University of Bu-Ali Sina, slide-mounted specimens in the Collection of the female and 5 paratypes females are deposited as males paratypes with the same data. The holotype (48º28’11.46”E and altitude 1930 m a.s.l), Hamedan Borkh. (Rosaceae), Hamedan (34º46’48.13”N, 48º28’11.46”E and altitude 1930 m a.s.l), Hamedan Province, Iran, 8 June 2011, Alireza Nazari; 6 females paratypes with the same data. The holotype female and 5 paratypes females are deposited as slide-mounted specimens in the Collection of the Acarology Laboratory, University of Bu-Ali Sina, Hamadan, Iran and one paratype female will be deposited in the National Collection of Arachnida, Plant Protection Research, Pretoria, South Africa.

Female (n = 7) — Color in life red. Idiosoma oval. Measurements of holotype with measurements of paratypes in parentheses: Length of body (excluding gnathosoma) 420 (419 – 441), (including gnathosoma) 523 (510 – 548); width 206 (206 – 245); length of leg I 240 (218 – 242); leg II 188 (175 – 193); leg III 185 (153 – 190), leg IV 223 (208 – 246).

The terminology and setal notations used in the descriptions of the new species follow those of Kethley (1990). All measurements are given in micrometers (μm) and the measurement of the paratypes is followed in brackets.

FAMILY STIGMAEIDAE ODUMANS, 1931

Type genus: Stigmaeus Koch, 1836 Stigmaeus Koch, 1836

Stigmaeus ladanae n. sp.

(Figs. 1-2)

Diagnosis — All dorsal, ventral and suranal shields reticulated, dorsal with 14 pairs of setae (h₁ present), eyes and post ocular bodies absent, median hysterosomal shield with two setae (c₁, d₁), genital setae two pairs, aggenital setae four pairs, genua 5(+1κ) - 5 - 2 - 2, propodosomal setae ve/vi 1.26 (1.29 – 1.35), ratio ve/ve-vi; 0.85 (0.54 – 0.80), c₁/c₁-c₁: 0.52 (0.46 – 0.51); c₁-c₁: d₁-d₁: e₁-e₁: f₁-f₁: 0.87 (1 – 1.86): 0.89 (0.81 – 1.60): 0.79 (0.81 – 1.09): 1.0.

Material examined — Holotype female, collected from soil beneath apple trees, Malus domestica Borkh. (Rosaceae), Hamedan (34º46’48.13”N, 48º28’11.46”E and altitude 1930 m a.s.l), Hamedan Province, Iran, 8 June 2011, Alireza Nazari; 6 females paratypes with the same data. The holotype female and 5 paratypes females are deposited as slide-mounted specimens in the Collection of the Acarology Laboratory, University of Bu-Ali Sina, Hamadan, Iran and one paratype female will be deposited in the National Collection of Arachnida, Plant Protection Research, Pretoria, South Africa.

Female (n = 7) — Color in life red. Idiosoma oval. Measurements of holotype with measurements of paratypes in parentheses: Length of body (excluding gnathosoma) 420 (419 – 441), (including gnathosoma) 523 (510 – 548); width 206 (206 – 245); length of leg I 240 (218 – 242); leg II 188 (175 – 193); leg III 185 (153 – 190), leg IV 223 (208 – 246).

Dorsum (Fig. 1A) — Prodorsal shield oblong and reticulated; bearing three pairs of setae (vi, ve, sci), eyes and post ocular bodies absent; dorsal hysterosoma with 10 pairs of setae, almost smooth, four pairs of paired and three unpaired shields and surrounded with entire and reticulated (Fig. 1A). Setae c₂ situated laterally between coxae II-III. Setae ve almost as long or slightly longer than setae vi, setae sce on lateral propodosomal shields, reticulated; lengths of dorsal setae: vi 23 (20 – 24), ve 29 (27 – 31), sci 28 (22 – 29), sce 30 (28 – 32), c₂ 25 (20 – 27), c₁ 41 (32 – 43), d₁ 19 (19 – 24), d₂ 21 (20 – 24), e₁ 22 (20 – 24), e₂ 21 (21 – 24), f₁ 30 (28 – 33), h₁ 32 (28 – 37), h₂ 40 (37 – 44); distances between dorsal setae: vi-vi 26 (25 – 44), ve-ve 50 (46 – 55), vi-vi 32 (25 – 34), sci-sci 85 (73 – 88), sce-sce 135 (131 – 152), ve-sci 47 (41 – 50), sci-sci 25 (18 – 34), c₁-c₁ 46 (43 – 53), c₁-c₁ 73 (57 – 89), c₂-c₂ 191 (170 – 206), c₁-d₁ 59 (48 – 64), d₁-d₁ 47 (37 – 43), d₁-d₂ 49 (44 – 56), d₁-e₁ 68 (62 – 71), d₁-e₂ 51 (48 – 69), d₂-e₂ 73 (71 – 77), d₂-d₂ 128 (118 – 151), e₁-e₁ 42 (25 – 43), e₂-e₂ 94 (87 – 121), e₁-e₂ 33 (29 – 40), e₁-f₁ 40 (30 – 42), f₁-f₁ 53 (23 – 53), f₁-h₁ 36 (32 – 45), h₁-h₁ 33 (31 – 38), f₁-h₂ 39 (36 – 43), h₂-h₂ 71 (64 – 72), h₁-h₂ 17 (15 – 21); ratio: vi/vi-vi 0.88 (0.54 – 0.80), c₁/c₁-c₁: 0.52 (0.46 – 0.51), d₁/d₁-d₁: 0.40 (0.51 – 0.55), e₁/c₁-e₁: 0.55 (0.55 – 0.8), f₁/f₁-f₁: 0.52 (0.62 – 1.21), h₁/h₁-h₁: 0.96 (0.90 – 0.97), h₂/h₂-h₂ 0.56 (0.57 – 0.61), h₁/h₂ 0.80 (057 – 0.84), c₁-c₁: d₁-d₁: e₁-e₁: f₁-f₁: 0.87(1 – 1.86): 0.89 (0.81 – 1.60): 0.79 (0.81 – 1.09): 1.

Venter (Fig. 1B) — Coxae I-IV and surrounded shields reticulated, coxisternal shields I-II and III-IV not fused in mid-line, longitudinal striae; cuticle transversely striate between coxisternal II-III; coxisternal shields I and III-IV surrounded by longitudinal striae (Fig. 1B). Length of setae l₁a 24 (18 – 25), l₁b 22 (8 – 24), l₁c 29 (21 – 32), l₂b 34 (25 – 35), l₂c 37 (28 – 37), l₁a 23 (18 – 25), l₂b 23 (18 – 24), l₂c 21 (17 – 24), l₄a 21 (18 – 24), l₄b 18 (14 – 19) and l₄c 19 (14 – 20).

Aggenital (ag₁-4) setae almost as long as ag₁-2, 3; and pseudanal seta ps₁; less than two times longer than seta ps₁; measurements of setae: setae ag₁ 18 (14 – 21), ag₂ 18 (16 – 20), ag₃ 22 (17 – 23), ag₄
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Figure 2: Stigmaeus ladanae n. sp. (female): A – leg I; B – leg II; C – leg III; D – leg IV.

22 (19 – 26), g1 19 (16 – 20), g2 29 (19 – 31), ps1 52 (36 – 53), ps2 28 (19 – 28), ps3 44 (38 – 46). Distances: ag1-ag1 33 (25 – 33), ag2-ag2 35 (33 – 38), ag3-ag3 49 (47 – 53), ag4-ag4 46 (46 – 61).

Gnathosoma (Fig. 1C) — Subcapitulum reticulated and with two pairs of subcapitular setae, m 23 (19 – 25) and n 18 (14 – 21), two pairs of adoral setae, or1 7 (4 – 8), or2 9 (7 – 10); distances: or1-or1 7 (5 – 18), or2-or2 14 (11 – 16), m-m 31 (29 – 36), n-n 23.

(23 – 25), or 1-m 25 (24 – 27), m-n 6 (5 – 7) (Fig. 1C).
Chelicerae free 55 (50 – 63), movable digit 25 (22 – 27) (Fig. 1C). Palpi five segmented, palp tarsus with
four simple setae + one simple eupathidium + one solenidion (ω) + one tridentate eupathidium, palp
tibia with two setae + one well developed claw + one accessory claw, palp genu with one setae and
palp femur with three setae.

Legs (Fig. 2) — Legs about half length of body.
Leg segments setal formulae as follows: coxae 2 - 2 - 2 - 2; trochanters 1 - 1 - 2 - 1; femora 4 - 4 - 3 - 2, genua
5+1κ - 5 - 2 - 2; tibiae 5+1φρ + 1φ - 5+1φρ - 5+1φρ - 5+1φρ; tarsi 13 +1ω - 9 +1ω - 7 +1ω - 7 +1ω.
Length of solenidia: ωI 19 (16-20), ωII 17 (14-18), ωIII 10 (7 – 12), ωIV 8 (6 – 9).

Male — Unknown.

Remarks — Stigmaeus ladanae n. sp. is closely
similar S. shabestariensis Haddad, Lotfollahi and Akbari, 2010 in having:

- setae h3,
- entire suranal shield,
- reticulated dorsal shields,
- the same legs chaetotaxy.

However, the new species differs in:

- lateral prodorsal shield reticulate in S. ladanae
  instead of smooth in S. shabestariensis,
- subcapilltulum faintly reticulated instead of
  faintly punctate,
- dorsal setae smooth instead of serrated,
- lateral zonal shields unique instead of divided
  in S. shabestariensis,
- base of setae ps1 reticulated instead of smooth
  in S. shabestariensis,
- ratio c1/c1-c1 0.52 (0.46 – 0.51) and e1/e1-e1 0.5 (0.55 – 0.8) in S. ladanae opposed to 0.40
  (0.20 – 0.40) and e1/e1-e1 0.34 (0.33 – 0.34) in S. shabestariensis,
- coxal plates I-IV and legs segments reticulated in the new species versus smooth in S.
  shabestariensis,
- aggenital and anal shields reticulated instead of smooth in S. shabestariensis,
- setae ps2 two times longer than ps1 instead of as long as in S. shabestariensis. Also
  this species resembles Stigmaeus pulchellus Kuznetsov, 1987 and S. alvandis Khanjani and
  Ueckermann, 2002 in having all dorsal and ventral shields, and leg segments reticulated,
eyes absent, two pairs of median zonal shield;
however it differs from that: aggenital shields reticulated, setae sce shorter than S. pulchellus, setae ps1
longer than h1, h2, h3 instead of as long as in S. pulchellus and also it differs from S. alvandis in that:

- the suranal shield entire whereas divided in S.
  alvandis,
- femur IV with two setae opposed to one seta
  in S. alvandis,
- setae ps1 longer than h1, h2, h3 instead of as
  long as in S. alvandis.

Etymology — The new species is named in honor
of Mrs. Ladan Mohammad, wife of senior author,
who kindly helped us in mite collection and who
is already post student (Agricultural Entomology),
Department of Plant Protection, College of Agricul-
ture, Bu-Ali Sina University, Hamedan, Iran.

Stigmaeus nasrinae n. sp.
(Figs. 3-4)

Diagnosis — Prodorsal area with a few reticula-
tions elements centrally, dorsum with 14 pairs of setae (h3 present), eyes and post ocular bodies absent,
genital setae two pairs, aggenital setae four pairs,
genua 5 - 2 - 0 - 1, palp tarsi with one bifurcate eu-
pathidium, propodosomal setae ve/vi 3.2, ratio vi/vi-
vi 0.59, c1/c1-c1 0.30; d1/d1-d1 0.40; c1-c1: d1-d1: e1-e1:
F2:F1 1.06: 0.77: 0.89: 1.

Material examined — Holotype female, col-
lected from soil under Apera spica-venti (L.)
(Poaceae) in Nahavand, Hamedan province (31°14'N, 48°23'E, altitude 1070 m a.s.l.), Iran, 23 September 2011, by Nasrin Nazari. One female paratype with the same data. The holotype female is deposited as slide-mounted specimens in the Collection of the Acarology Laboratory, University of Bu-Ali Sina, Hamadan, Iran. One female paratype will be deposited in the National Collection of Arachnida, Plant Protection Research, Pretoria, South Africa.

Female (n = 2) — Color in life red. Idiosoma oval. Measurements of holotype: Length of body (excluding gnathosoma) 370 (374); width 197 (203); length of leg I 167 (165); leg II 138 (134); leg III 130 (128), leg IV 162 (164).

Dorsum (Fig. 3A) — Prodorsum with a few reticulations elements centrally; with three pairs of setae (vi, ve, sci), eyes and poε absent (Fig. 3A); dorsal hysterosoma covered with longitudinal striae, with nine pairs of setae, almost smooth and four pairs of paired shields (Fig. 3A). Setae c2 situated ventrolaterally between coxae II-III. Setae ve 3.2 (2.9) times longer than setae vi, setae sce on lateral propodosomal area; central hysterosoma stiated, suranal shield divided and smooth and bearing three pairs of setae (h1, h2 and h3), h2 almost 1.5 times longer than h1 and h3 (Fig. 3A); lengths of dorsal setae: vi 15 (17), ve 48 (49), sci 13 (16), sce 24 (21), c1 16 (15), c2 38 (39), d1 15 (15), d2 14 (14), e1 15 (15), e2 14 (15), f1 17 (17), h1 18 (18), h2 27 (26), h3 20 (21); distances between dorsal setae: vi-ve 27, ve-ve 35, ve-ve 15 (16), sci-sci 53, sce-sce 124, ve-sci 34 (32), c1-sci 66 (64), c2-sce 124 (127), c1-c1 51 (54), c1-c2 70 (53), c2-c2 172 (175), c1-d1 54 (57), d1-d1 37, d1-d2 49 (50), d1-e1 43 (44), d1-e2 63 (65), d2-e2 55 (57), d2-d2 141 (143), e1-e1 41 (44), e2-e2 128, e1-e2 43 (47), f1-f1 28 (28), f1-f1 48, f1-f1 47 (48), h1-h1 27, f1-h2 48 (46), h2-h2 40 (42); ratio: vi/ve-ve 0.59, c1/c1-c1 0.30, d1/d1-d1 0.40, e1/e1-e1 0.36, f1/f1-f1 0.35, h1/h1- h1 0.66, h2/h2-h2 0.67, h1/h2 0.66 (0.69), c1-c1: d1-d1: e1-e1: f1-f1 1.06: 0.77: 0.89: 1.

Venter (Fig. 3B) — Coxisternal II- and III-IV present, smooth. Ventral cuticle transversely striate between coxisternal II-III; coxisternallae I- and III-IV surrounded by longitudinal striae (Fig. 3B).

Length of setae Ia 20 (19), Ib 18 (17), Ic 25 (26), Ia 39 (38), 2c 25 (29), 3a 21 (18), 3b 21 (23), 3c 17 (16), 4a 18 (16), 4b 10 (13) and 4c 12 (13). Aggenital (ag1-4) setae ag1 as long as ag2-3, and genital setae ag- longer than g1; pseudanal seta ps3 almost one half length of setae ps1-2; measurements of setae: ag1 16 (15), ag2 14 (13), ag3 21 (23), ag4 23 (24), g1 14 (13), g2 13 (12), ps1 19 (18), ps2 13 (15) ps3 20 (17). Distances: ag1-ag1 24, ag2-ag2 32, ag3-ag3 43, ag4-ag4 36.

Gnathosoma (Figs. 3C, 3D). Subcapitulum with two pairs of subcapitular setae and smooth, m 19 (18) and n 19 (19), two pairs of dorsal setae, or1 5 (5), or2 10 (9); distances: or1-or1 8, or2-or2 12, m-m 26, or3-or3 33 (34), m-n 7 (Fig. 3D). Chelicerae free 58 (60), movable digit 27 (27). Palpi five segmented, palp tarsus with five simple setae, one solenidion (ω) 5 (6), one bifurcate eupathidium, palp tibia with two setae + one well developed claw + one accessory claw, palp genu with one setae and palp femur with three setae (Fig. 3C).

Legs (Fig. 4) — Legs about half length of body. Setal formulæ of leg segments as follows (specialized sensory setae such as solenidia, in parenthesis): coxae 2-2-2-2-2; trochanters 1-1-2-1-1; femora 4-4-4-3-2; genua 5-1-2-0-1; tibiae 5+1φφ+1φ - 5+1φφ - 5+1φφ; 13 (1ω) - 8 (1ω) - 7 (1ω) - 7 (1ω).

Length of solenidia: ωI 10 (11), ωII 7 (6), ωIII 4 (4), ωIV 4 (4).

Male — Unknown.

Remarks — Stigmaeus nasrinas n. sp. exhibits most features of the S. elongatus Berlese (in having a few retriculations elements in median prodorsal area, eyes absent, h3 present, palp tibia with three setae. However the new species differs from the latter in: femora I-IV 4-4-3-2 in the new species instead of 6-6-3-2 in S. elongatus, genua 5-2-0-1 instead of 6-5-3-3 in S. elongatus, tarsi II with 8+1ω oppose to 9+1ω in S. elongates, suranal shield divided instead of entire, aggenital shields with four pairs of setae and two pairs of genital setae instead of five pairs and three pairs respectively in S. elongates. Also closely resembles S. caeculus Barilo in having the same legs chaetotaxy dorsal pattern, however differs from the latter by:

- suranal shield with three pairs of setae (h1-3) in S. nasrinas instead of two pairs in S. caeculus,
FIGURE 3: Stigmaeus nasriniae n. sp. (female): A – Dorsum; B – Venter; C – Chelicerae; D – Subcapitulum and palp.
- seta $f_1$ set on the platelet in the new species whereas on the soft integument $S. caeculus$,

- aggenital shields entire instead of divided,

- 27 (26) in the new species, 33 in $S. caeculus$.

Etymology — The species is named after Mrs. Nasrin Nazari, who kindly assisted senior author in mite collection.

ACKNOWLEDGEMENTS

The authors wish to thank Prof. Salih Doğan, Erzincan University, Arts and Sciences Faculty, Department of Biology, Erzincan, Turkey for his critical review of this manuscript and valuable comment, and suggestions.

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