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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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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* Kuznetsov, 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. ueckermanni* 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-

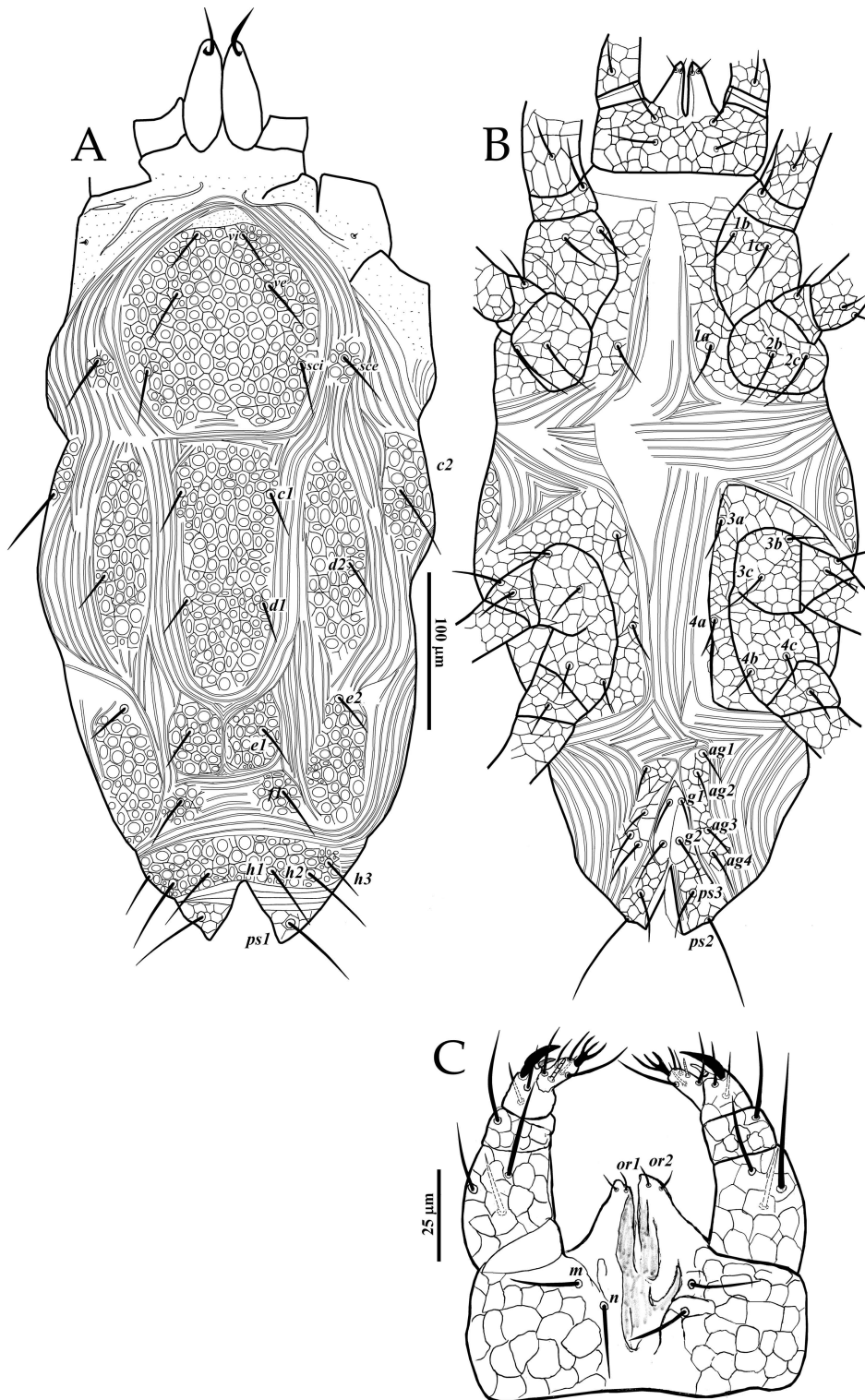


FIGURE 1: *Stigmaeus ladanae* n. sp. (female): A – Dorsum; B – Venter; C – gnathosoma.

nification of an Olympus BX₅₁. Body length measurements represent the distance between base of gnathosoma and end of idiosoma; width was measured above coxa III. Setae were measured from the setal base to the tip of the seta; distances between setae were measured between setal bases. Legs measurements are from coxa to pre tarsus.

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 OUDEMANS, 1931

Type genus: *Stigmaeus* Koch, 1836 *Stigmaeus* Koch, 1836 Type species: *Stigmaeus cruentus* Koch, 1836

Stigmaeus ladanae n. sp.

(Figs. 1-2)

Diagnosis — All dorsal, ventral and suranal shields reticulated, dorsum with 14 pairs of setae (h_3 present), eyes and post ocular bodies absent, median hysterosomal shield with two setae (c_1, d_1), genital setae two pairs, aggenital setae four pairs, genua 5(+1 κ) - 5 - 2 - 2, propodosomal setae ve/vi 1.26 (1.29 - 1.35), ratio v_i/v_i-v_i 0.85 (0.54 - 0.80), c_1/c_1-c_1 0.52 (0.46 - 0.51); $c_1-c_1: d_1-d_1: e_1-e_1: f_1-f_1: 0.87$ (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 (34°46'48.13"N, 48°28'11.46"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 c_2 situated laterally between coxae II-III. Setae ve almost as long as or slightly longer than setae vi , setae sce on lateral propodosomal shields, reticulated; lengths of dorsal setae: v_1 23 (20 - 24), ve 29 (27 - 31), sc_1 28 (22 - 29), sc_2 30 (28 - 32), c_1 25 (20 - 27), c_2 41 (32 - 43), d_1 19 (19 - 24), d_2 21 (20 - 24), e_1 22 (20 - 24), e_2 21 (21 - 24), f_1 30 (28 - 33), h_1 32 (28 - 37), h_2 40 (37 - 44); distances between dorsal setae: $vi-vi$ 26 (25 - 44), $ve-ve$ 50 (46 - 55), $vi-ve$ 32 (25 - 34), $sci-sci$ 85 (73 - 88), $sce-sce$ 135 (131 - 152), $ve-sci$ 47 (41 - 50), $sci-sce$ 25 (18 - 34), c_1-c_1 46 (43 - 53), c_1-c_2 73 (57 - 89), c_2-c_2 191 (170 - 206), c_1-d_1 59 (48 - 64), d_1-d_1 47 (37 - 43), d_1-d_2 49 (44 - 56), d_1-e_1 68 (62 - 71), d_1-e_2 51 (48 - 69), d_2-e_2 73 (71 - 77), d_2-d_2 128 (118 - 151), e_1-e_1 42 (25 - 43), e_2-e_2 94 (87 - 121), e_1-e_2 33 (29 - 40), e_1-f_1 40 (30 - 42), f_1-f_1 53 (23 - 53), f_1-h_1 36 (32 - 45), h_1-h_1 33 (31 - 38), f_1-h_2 39 (36 - 43), h_2-h_2 71 (64 - 72), h_1-h_2 17 (15 - 21); ratio: $vi/vi-vi$ 0.88 (0.54 - 0.80), c_1/c_1-c_1 0.52 (0.46 - 0.51), d_1/d_1-d_1 0.40 (0.51 - 0.55), e_1/e_1-e_1 0.5 (0.55 - 0.8), f_1/f_1-f_1 0.52 (0.62 - 1.21), h_1/h_1-h_1 0.96 (0.90 - 0.97), h_2/h_2-h_2 0.56 (0.57 - 0.61), h_1/h_2 0.80 (0.57 - 0.84), $c_1-c_1: d_1-d_1: e_1-e_1: f_1-f_1: 0.87$ (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-II and III-IV surrounded by longitudinal striae (Fig. 1B). Length of setae $1a$ 24 (18 - 25), $1b$ 22 (8 - 24), $1c$ 29 (21 - 32), $2b$ 34 (25 - 35), $2c$ 37 (28 - 37), $3a$ 23 (18 - 25), $3b$ 23 (18 - 24), $3c$ 21 (17 - 24), $4a$ 21 (18 - 24), $4b$ 18 (14 - 19) and $4c$ 19 (14 - 20). Aggenital (ag_{1-4}) setae ag_1 almost as long as ag_{2-3} ; and pseudanal seta ps_1 less than two times longer than seta ps_3 ; measurements of setae: setae ag_1 18 (14 - 21), ag_2 18 (16 - 20), ag_3 22 (17 - 23), ag_4

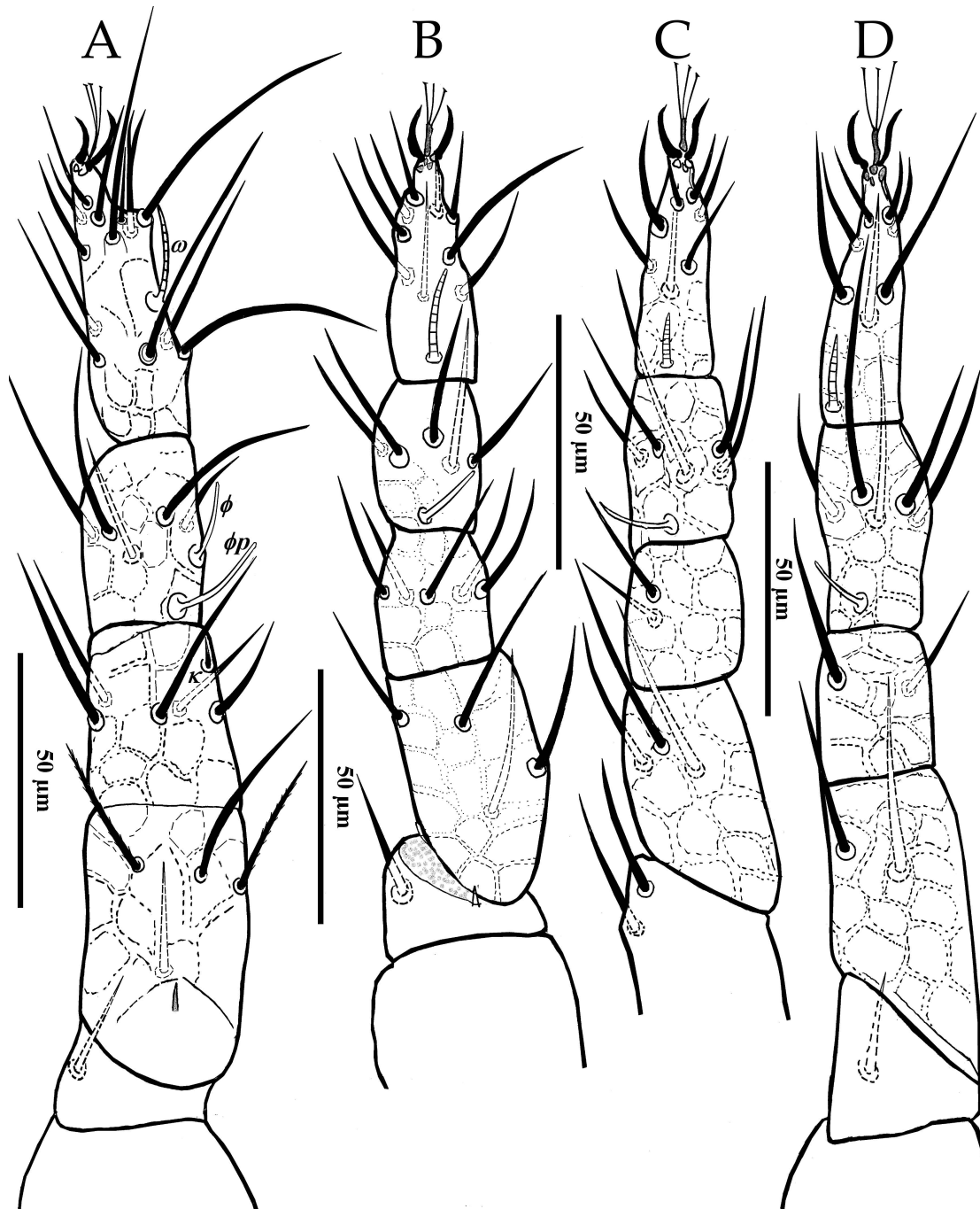


FIGURE 2: *Stigmaeus ladanae* n. sp. (female): A – leg I; B – leg II; C – leg III; D – leg IV.

22 (19 – 26), g_1 19 (16 – 20), g_2 29 (19 – 31), ps_1 52 (36 – 53), ps_2 28 (19 – 28), ps_3 44 (38 – 46). Distances: ag_1-ag_1 33 (25 – 33), ag_2-ag_2 35 (33 – 38), ag_3-ag_3 49 (47 – 53), ag_4-ag_4 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, or_1 7 (4 – 8), or_2 9 (7 – 10); distances: or_1-or_1 7 (5 – 18), or_2-or_2 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+1 κ - 5 - 2 - 2; tibiae 5+1 $\varphi\rho$ +1 φ - 5+1 $\varphi\rho$ - 5+1 $\varphi\rho$ - 5+1 $\varphi\rho$; tarsi 13 +1 ω - 9 +1 ω - 7 +1 ω - 7 +1 ω . Length of solenidia: ω I 19 (16-20), ω II 17 (14-18), ω III 10 (7 – 12), ω IV 8 (6 – 9).

Male — Unknown.

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

- setae h_3 ,
- 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*,
- subcapitulum 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 ps_1 reticulated instead of smooth in *S. shabestariensis*,
- ratio c_1/c_1-c_1 0.52 (0.46 – 0.51) and e_1/e_1-e_1 0.5 (0.55 – 0.8) in *S. ladanae* opposed to 0.40 (0.20 – 0.40) and e_1/e_1-e_1 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 ps_2 two times longer than ps_1 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 ps_1 longer than h_1, h_2, h_3 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 ps_1 longer than h_1, h_2, h_3 instead of as long as in *S. alvandis*.

Etymology — The new species is named in honor of Mrs. Ladan Mohammadi, 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 Agriculture, Bu-Ali Sina University, Hamedan, Iran.

Stigmaeus nasrinae n. sp.

(Figs. 3-4)

Diagnosis — Prodorsal area with a few reticulations elements centrally, dorsum with 14 pairs of setae (h_3 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 eupathidium, propodosomal setae ve/vi 3.2, ratio $vi/vi-vi$ 0.59, c_1/c_1-c_1 0.30; d_1/d_1-d_1 0.40; $c_1-c_1: d_1-d_1: e_1-e_1: f_1-f_1$ 1.06: 0.77: 0.89: 1.

Material examined — Holotype female, collected 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 (132), leg IV 162 (164).

Dorsum (Fig. 3A) — Prodorsum with a few reticulations elements centrally; with three pairs of setae (*vi*, *ve*, *sci*), eyes and *pob* 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 *c*₂ situated ventrolaterally between coxae II-III. Setae *ve* 3.2 (2.9) times longer than setae *vi*, seta *sce* on latral propodosomal area; central hysterosoma striated, suranal shield divided and smooth and bearing three pairs of setae (*h*₁, *h*₂ and *h*₃), *h*₂ almost 1.5 times longer than *h*₁ and *h*₃ (Fig. 3A); lengths of dorsal setae: *vi* 15 (17), *ve* 48 (49), *sci* 13 (16), *sce* 24 (21), *c*₁ 16 (15), *c*₂ 38 (39), *d*₁ 15 (15), *d*₂ 14 (14), *e*₁ 15 (15), *e*₂ 14 (15), *f*₁ 17 (17), *h*₁ 18 (18), *h*₂ 27 (26), *h*₃ 20 (21); distances between dorsal setae: *vi-vi* 27, *ve-ve* 35, *vi-ve* 15 (16), *sci-sci* 53, *sce-sce* 124, *ve-sci* 34 (32), *c*_{1-sci} 66 (64), *c*_{2-sce} 124 (127), *c*_{1-c}₁ 51 (54), *c*_{1-c}₂ 70 (53), *c*_{2-c}₂ 172 (175), *c*_{1-d}₁ 54 (57), *d*_{1-d}₁ 37, *d*_{1-d}₂ 49 (50), *d*_{1-e}₁ 43 (44), *d*_{1-e}₂ 63 (65), *d*_{2-e}₂ 55 (57), *d*_{2-d}₂ 141 (143), *e*_{1-e}₁ 41 (44), *e*_{2-e}₂ 128, *e*_{1-e}₂ 43 (47), *e*_{1-f}₁ 28 (28), *f*_{1-f}₁ 48, *f*_{1-h}₁ 47 (48), *h*_{1-h}₁ 27, *f*_{1-h}₂ 48 (46), *h*_{2-h}₂ 40 (42); ratio: *vi/vi-vi* 0.59, *c*_{1/c}_{1-c}₁ 0.30, *d*_{1/d}_{1-d}₁ 0.40, *e*_{1/e}_{1-e}₁ 0.36, *f*_{1/f}_{1-f}₁ 0.35, *h*_{1/h}_{1-h}₁ 0.66, *h*_{2/h}_{2-h}₂ 0.67, *h*_{1/h}₂ 0.66 (0.69), *c*_{1-c}₁: *d*_{1-d}₁: *e*_{1-e}₁: *f*_{1-f}₁ 1.06: 0.77: 0.89: 1.

Venter (Fig. 3B) — Coxisternal I-II and III-IV present, smooth. Ventral cuticle transversely striate between coxisternal II-III; coxisternallae I-II and III-IV surrounded by longitudinal striae (Fig. 3B). Length of setae *1a* 20 (19), *1b* 18 (17), *1c* 25 (26), *2b* 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 (*ag*₁₋₄) setae *ag*₁ as long as *ag*₂₋₃; and genital setae *g*₂ longer than *g*₁; pseudanal seta *ps*₃ almost one half length of setae *ps*₁₋₂; measurements of setae: *ag*₁ 16 (15), *ag*₂ 14 (13), *ag*₃ 21 (23), *ag*₄ 23 (24), *g*₁ 14 (13), *g*₂ 13 (12), *ps*₁ 19 (18), *ps*₂ 13(15) *ps*₃ 20 (17). Distances: *ag*_{1-ag}₁ 24, *ag*_{2-ag}₂ 32, *ag*_{3-ag}₃ 43, *ag*_{4-ag}₄ 36.

Gnathosoma (Figs. 3C, 3D). Subcapitulum with two pairs of subcapitular setae and smooth, *m* 19 (18) and *n* 19 (47), two pairs of adoral setae, *or*₁ 5 (5), *or*₂ 10 (9); distances: *or*_{1-or}₁ 8, *or*_{2-or}₂ 12, *m-m* 22, *n-n* 26, *or*_{1-m} 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 formulae of leg segments as follows (specialized sensory setae such as solenidia, in parenthesis): coxae 2-2-2-2; trochanters 1-1-2-1; femora 4-4-3-2, genua 5-2-0-1; tibiae 5+1 ϕ ρ +1 ϕ -5+1 ϕ ρ -5+1 ϕ ρ -5+1 ϕ ρ ; 13 (1 ω) - 8 (1 ω) - 7 (1 ω) - 7 (1 ω). Length of solenidia: ω I 10 (11), ω II 7 (6), ω III 4 (4), ω IV 4 (4).

Male — Unknown.

Remarks — *Stigmaeus nasrinae* n. sp. exhibits most features of the *S. elongatus* Berlese (in having a few reticulations elements in median prodorsal area, eyes absent, *h*₃ 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+1 ω oppose to 9+1 ω 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 (*h*₁₋₃) in *S. nasrinae* instead of two pairs in *S. caeculus*,

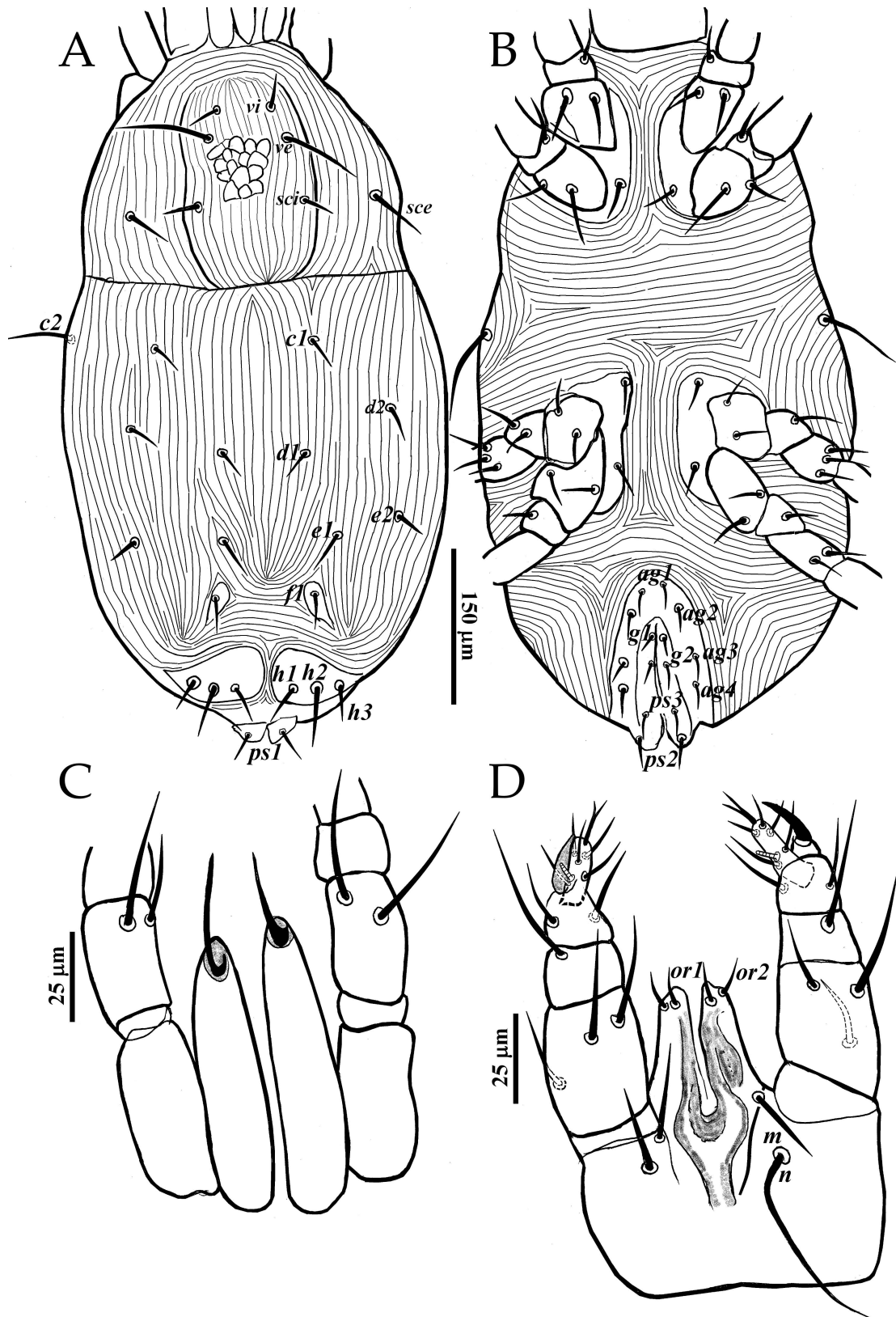


FIGURE 3: *Stigmaeus nasrinae* n. sp. (female): A – Dorsum; B – Venter; C – Chelicerae; D – Subcapitulum and palp.

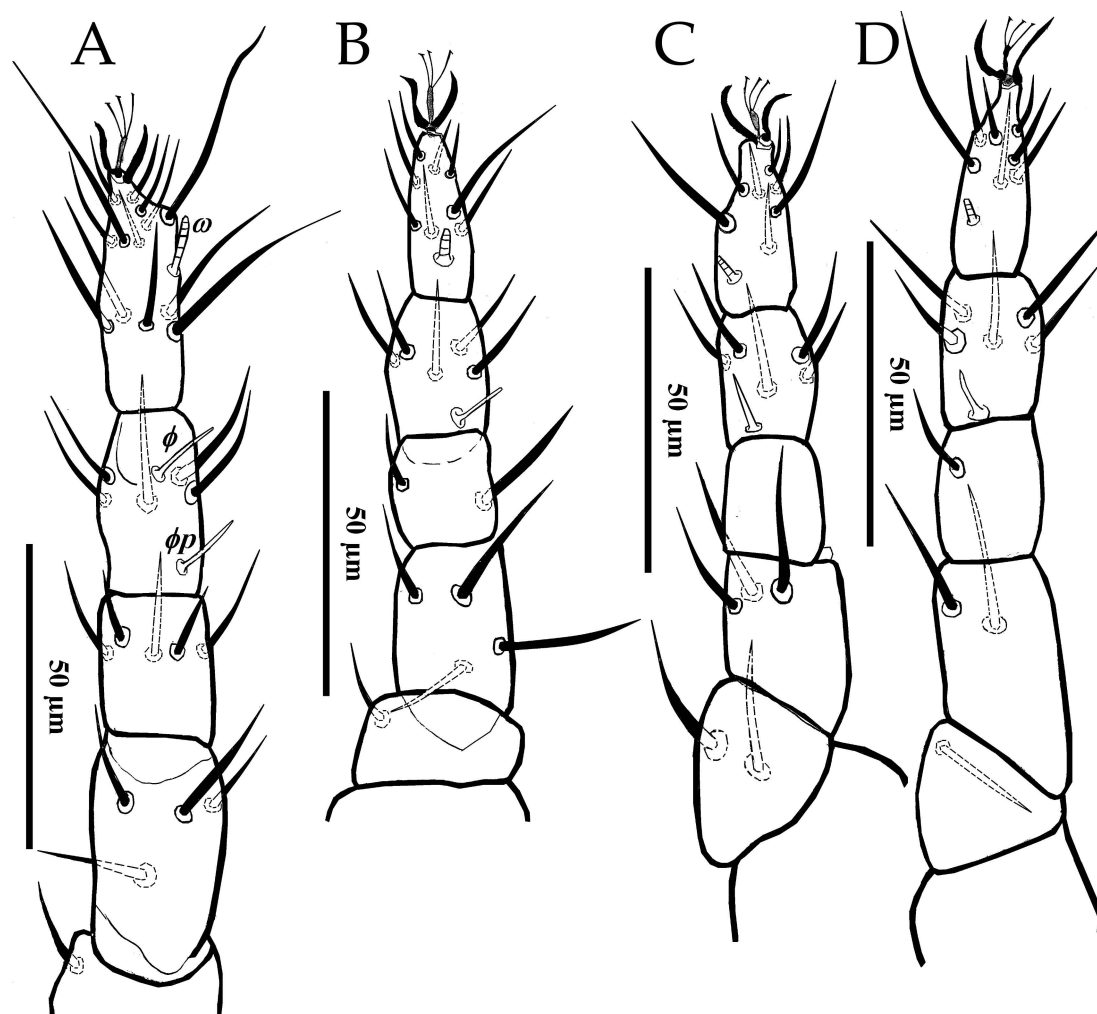


FIGURE 4: *Stigmaeus nasrinae* n. sp. (female): A – Leg I; B – Leg II; C – Leg III; D – Leg IV.

- 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.

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