Persian J. Acarol., 2017, Vol. 6, No. 3, pp. 193–201.
http://dx.doi.org/10.22073/pja.v6i3.30534
Journal homepage: http://www.biotaxa.org/pja

http://zoobank.org/urn:lsid:zoobank.org:pub:24BCEB1F-C5A7-4A39-A705-CC993B9A4A52

Article

A new species of the genus *Ledermuelleriopsis* (Acari: Stigmaeidae) from Markazi province, Iran

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ABSTRACT
A new species of the genus *Ledermuelleriopsis, L. aminiae* **sp. nov.** is described and illustrated based on female and male specimens collected from soil under oak trees, Karchan region, Markazi province, Iran.

KEY WORDS: Description; mite; new taxon; predator; small arthropods.

PAPER INFO.: Received: 10 May 2017, Accepted: 23 June 2017, Published: 15 July 2017

INTRODUCTION

Members of the family Stigmaeidae are predators; they feed on spider mites, scale insects, especially their eggs, and also small arthropods (Khanjani *et al.* 2010). Genus *Ledermuelleriopsis* was created by Willmann (1953) and known species are found in most parts of the world (Fan and Zhang 2005; Fan *et al.* 2016). They live in soil, litter, grass, moss, lichen, decayed stump, bark trees and old dune sand (Bingül and Doğan 2016). Up to now, 33 species of this genus are described worldwide (Bingül and Doğan 2016; Fan *et al.* 2016) of which nine species have been recorded and described from Iran, namely: *Ledermuelleriopsis ariyai* Khanjani et *al*., 2012, *L. ayhani* Maleki & Bagheri, 2013; *L. dogani* Khanjani *et al.*, 2012; *L. medicae* Khanjani & Ueckermann, 2002; *L. plumosa* Willmann, 1951 (by Khanjani and Ueckermann 2002); *L. punicae* Khanjani *et al.*, 2012; *L. tamariski* Maleki & Bagheri, 2013, *L. terrulenta* Ueckermann & Meyer, 1987 (by Khanjani and Kamali 2000) and *L. zahiri* Khanjani & Ueckermann 2002. In this paper *L. aminiae* **sp. nov.** is described from Markazi province, Iran.

MATERIALS AND METHODS

Mites were collected from soil under oak trees in Markazi province and mounted directly in Hoyer's medium. The specimens were measured, identified and drawn by means of an Olympus BX_{51} differential interference contrast (DIC) microscope under 1000× magnification and equipped with a drawing tube. Body length measurements represent the distance between base of gnathosoma and end of idiosoma; width was measured above coxae III. Setae were measured from the setal base to

the tip of the setae; distances between setae were measured between setal bases. Legs measurements are from trochanter to tip top of tarsus. All measurements are given in micrometers.

The terminology and abbreviations used in the description of the new species follows that of Kethley (1990). Leg chaetotaxy is adapted from Fan and Zhang (2005).

RESULTS

Family Stigmaeidae Oudemans, 1931
Genus *Ledermuelleriopsis* Willmann, 1953

Type species: *Ledermuelleriopsis triscutata* Willmann, 1951, by subsequent designation.

Ledermuelleriopsis aminiae sp. nov. (Figs. 1–16)

Diagnosis (female)

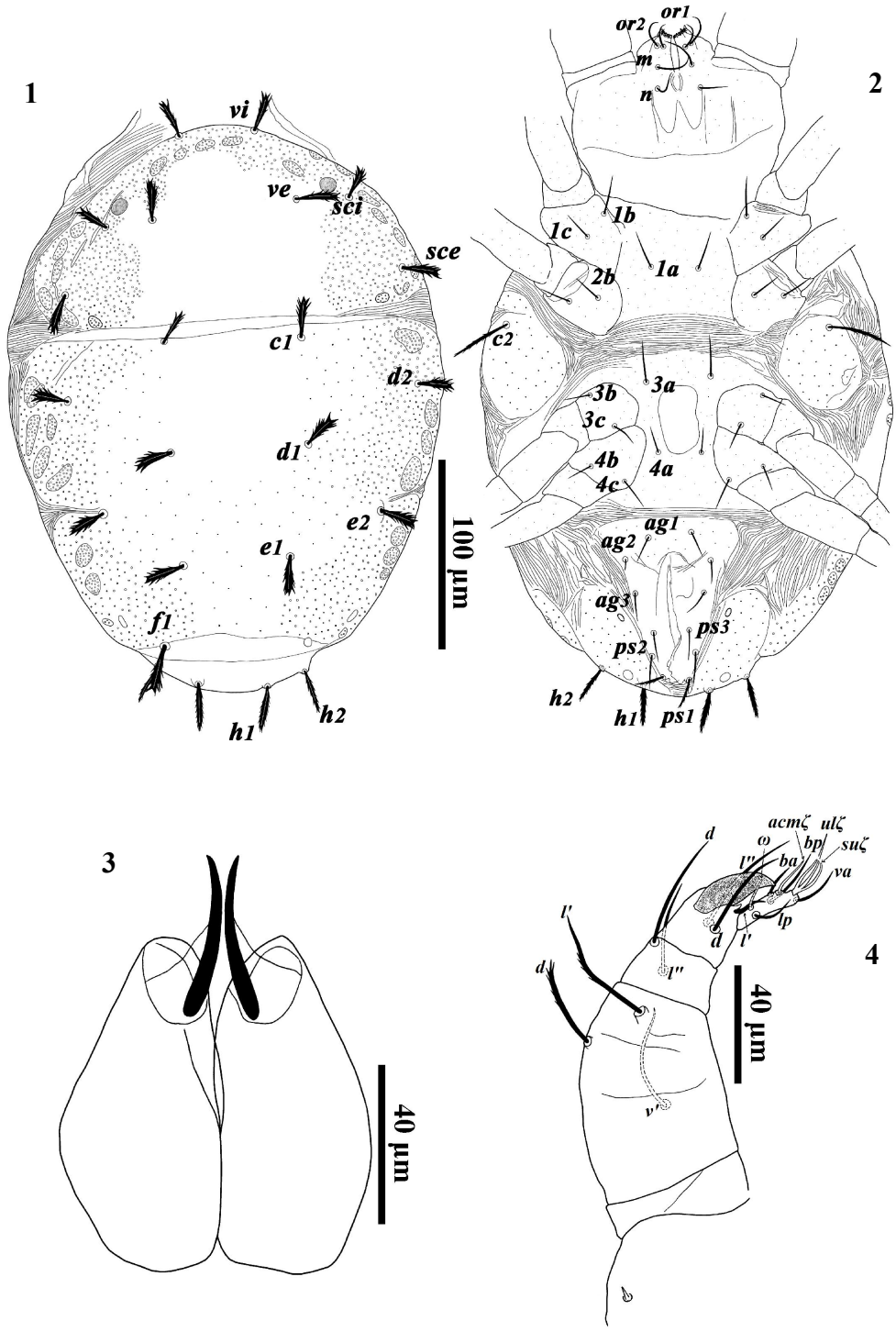
Anterior and lateral of idiosoma with large pits and vacuoles, metapodosomal and opisthosomal shields separated incompletely, setae f_1 28 (27–28), humeral shields anteriorly divided; palp tibial accessory claw seta-like; coxisternal shields between coxae I–II, III–IV fused at midline and punctuated; aggenital shield and with three pairs of setae; femora I-II with 6-4 and genua I-II with 3 (1κ) setae.

Female (n = 3) (Figs. 1–8) – Idiosoma oval. Measurements in ranges (paratypes measurements follow that of holotype in parenthesis): Length of body (including gnathosoma) 406 (380–422) (excluding gnathosoma) 326 (285–330); width 247 (232–270).

Dorsum (Figs. 1, 2) – Dorsal idiosoma covered with four shields (prodorsomal, metapodosomal, opisthosomal and suranal shields), anterior and lateral of idiosoma with large pits and vacuoles; prodorsal shield with four pairs of setae (*vi*, *ve*, *sci* and *sce*), a pair eyes 9 (8–10); metapodosomal and opisthosomal shields separated incompletely, metapodosomal shield with three pairs of setae (c_1, $d_{1\text{-}2}$), opisthosomal shield with setae $e_{1\text{-}2}$ and f_1 and suranal shield bears two pairs of setae (h_1, h_2). Dorsal setae clavate and spinose. Humeral shields divided anteriorly (anterior small and posterior large) (Fig. 2), punctulated and bearing setae c_2 situated ventro-laterally between coxae II–III. Lengths of dorsal setae as follows: *vi* 23 (21–22), *ve* 26 (26–27), *sci* 20 (21–22), *sce* 24 (23–24), c_1 23 (21–23), c_2 40 (34–41), d_1 24 (21–23), d_2 23 (21), e_1 24 (22–24), e_2 23 (21–22), f_1 28 (27–28), h_1 28 (25–27), h_2 26 (27–29). Distances between dorsal setae: *vi–vi* 44 (44–49), *ve–ve* 83 (84–91), *sci–sci* 143 (135–149), *sce–sce* 195 (182–206), c_1–c_1 78 (70–86), c_2–c_2 196 (198–201), d_2–d_2 199 (191–214), d_1–d_1 76 (76–79), e_1–e_1 61 (56–72), e_2–e_2 156 (141–142), f_1–f_1 82 (79–91), h_1–h_1 39 (37–39), h_2–h_2 87 (71–90), d_1–d_2 70 (63–74), e_1–e_2 54 (49–54), h_1–h_2 25 (21–27), d_2–e_2 72 (63–79), c_1–d_1 63 (56–69), d_1–e_1 63 (60–72), e_1–f_1 49 (43–52), f_1–h_1 33 (24–43), *vi/vi–vi* 0.52 (0.44–0.48), c_1/c_1–c_1 0.30 (0.27–0.30), d_1/d_1–d_1 0.31 (0.28–0.29), e_1/e_1–e_1 0.39 (0.33–0.39), f_1/f_1–f_1 0.34 (0.31–0.34), h_1/h_1–h_1 0.72 (0.67–0.69), h_2/h_2–h_2 0.30 (0.32–0.38), h_1/h_2 1.08 (0.92–0.93), c_1–c_1: d_1–d_1: e_1–e_1: f_1–f_1: 0.95 (0.88–0.94): 0.93 (0.87–0.96): 0.74 (0.71–0.79): 1.0 (1.0–1.0).

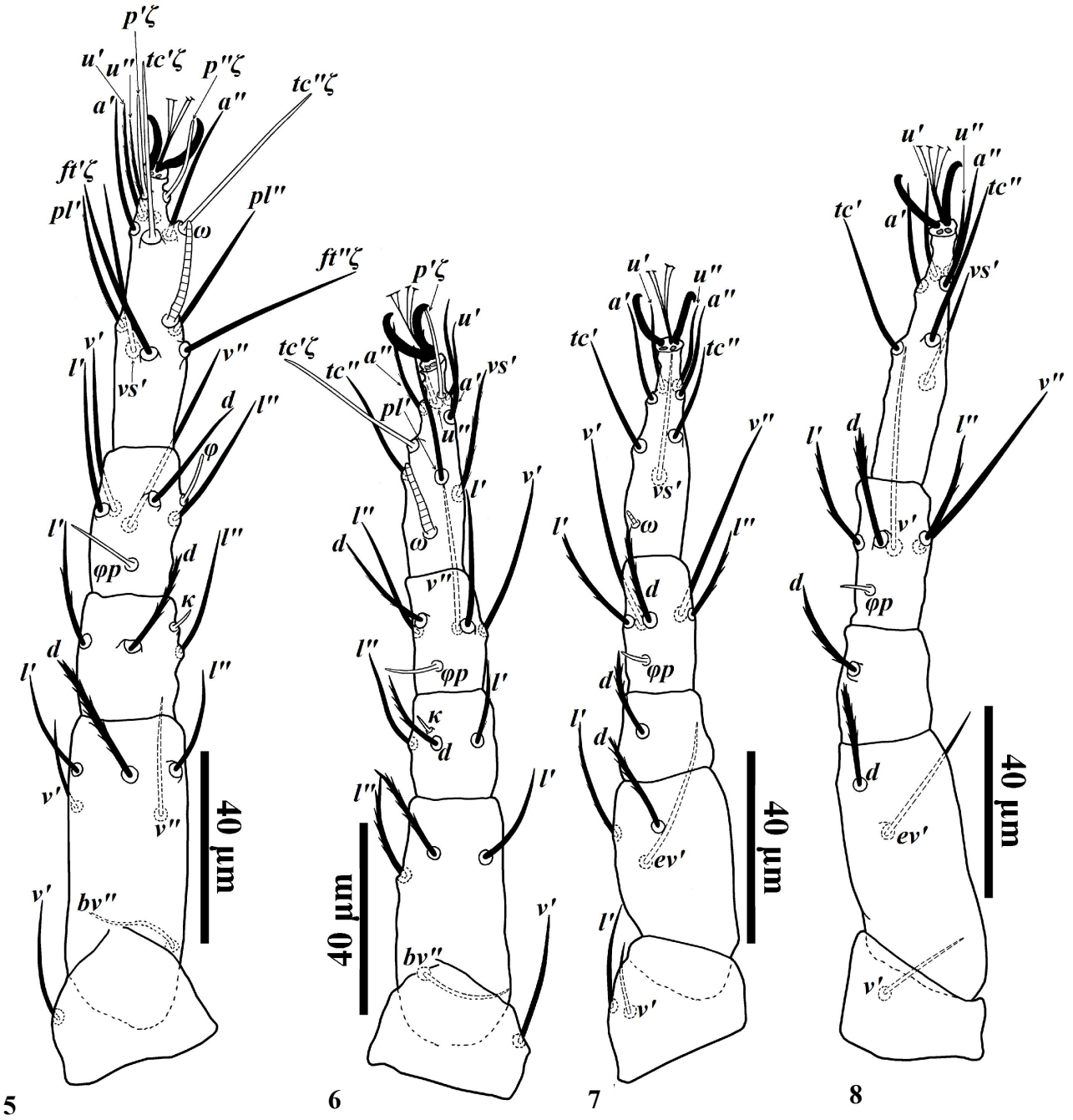
Venter (Fig. 2) – Ventral cuticle transversely striated between coxae II and III. Coxisternal shields between coxae I-II, III-IV fused at midline and punctuated. Length of setae: *1a* 21 (20–21), *1b* 22 (23–25), *1c* 18 (17–19), *2b* 19 (18–19), *2c* 19 (18–21), *3a* 21 (20–23), *3b* 18 (18–20), *3c* 17 (16–19), *4a* 14 (16–18), *4b* 16 (14–18), *4c* 16 (13–17), ag_1 14 (13–15), ag_2 15 (14–16), ag_3 16 (15–19), ps_1 19 (21–22), ps_2 20 (17–21) and ps_3 17 (16–22). Distances: *1a–1a* 28 (28–33), 3*a*–3*a* 40 (41–45), *4a–4a* 28 (25–32), ag_1–ag_1 25 (17–23), ag_2–ag_2 50 (42–55), ag_3–ag_3 41 (37–46), ps_1–ps_1 16 (10–22), ps_2–ps_2 26 (19–31), ps_3–ps_3 21 (21–33). Ratio: *1a–1a*: *3a–3a*: *4a–4a* = 1.0 (1.03–1.12): 1.42 (1.40–1.64): 1.0 (1.0). Aggenital and anal shields punctuated, with three pairs of setae.

Gnathosoma (Figs. 3–4) – Subcapitulum 69 (75–76) with two pairs of subcapitular setae, *n* 21 (15–17), *m* 20 (21–25), two pairs of adoral setae or_1 17 (15–16), or_2 18 (16–19). Chelicerae: fixed digit 87 (78–80), fixed digit almost two times longer than movable digit 41 (40–41) (Fig. 3). Palp tarsus with four simple setae, one solenidion (ω 9) and two eupathidia (one simple and a tridentate); palp tibia with two setae, one well developed claw and one seta-like accessory claw; Palp genu with one dorsal seta and one ventral seta; palp femur with three setae (Fig. 4).



Figures 1–4. *Ledermuelleriopsis aminiae* **sp. nov.** (female) – 1. Dorsal view of idiosoma; 2. Ventral view of idiosoma and subcapitulum; 3.Chlicerae; 4. Palp.

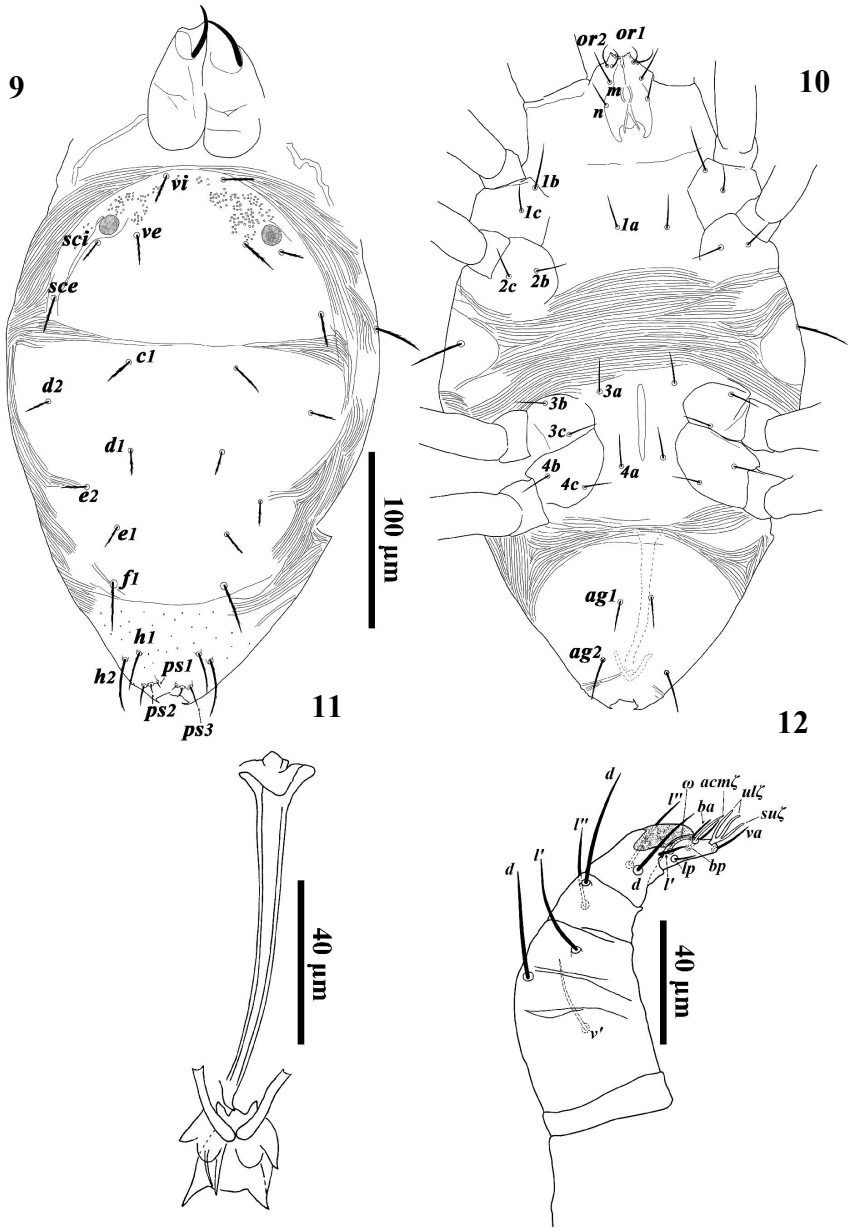
Legs (Figs. 5–8) – Lengths: leg I 184 (182–197); leg II 152 (150–160); leg III 150 (150–160), leg IV 174 (170–185); setal formulae of Leg segments (solenidia in parentheses and not included in setal counts) as follows: coxae 2-2-2-2; trochanters 1-1-2-1; femora 6-4-3-2; genua 3(+*κ*)-3(+*κ*)-1-1; tibiae 5 (+*φ*, +*φp*)-5(+*φp*)-5(+*φp*)-5(+*φp*); tarsi 13(+*ω*)-9(+*ω*)-7(+*ω*)-7. Length of solenidia: I*ω* 24 (23–29), II*ω* 16 (14–18), III*ω* 4 (3–4). I*φρ* 16 (15–18), I*φ* 10 (9–11), II*φρ* 11 (10–13), III*φρ* 6 (6–9), IV*φρ* 7 (7–8), I*κ* 5 (4–5), II*κ* 4 (3–4).



Figures 5–8. *Ledermuelleriopsis aminiae* **sp. nov.** (female) – 5. Leg I; 6. Leg II; 7. Leg III; 8. Leg IV.

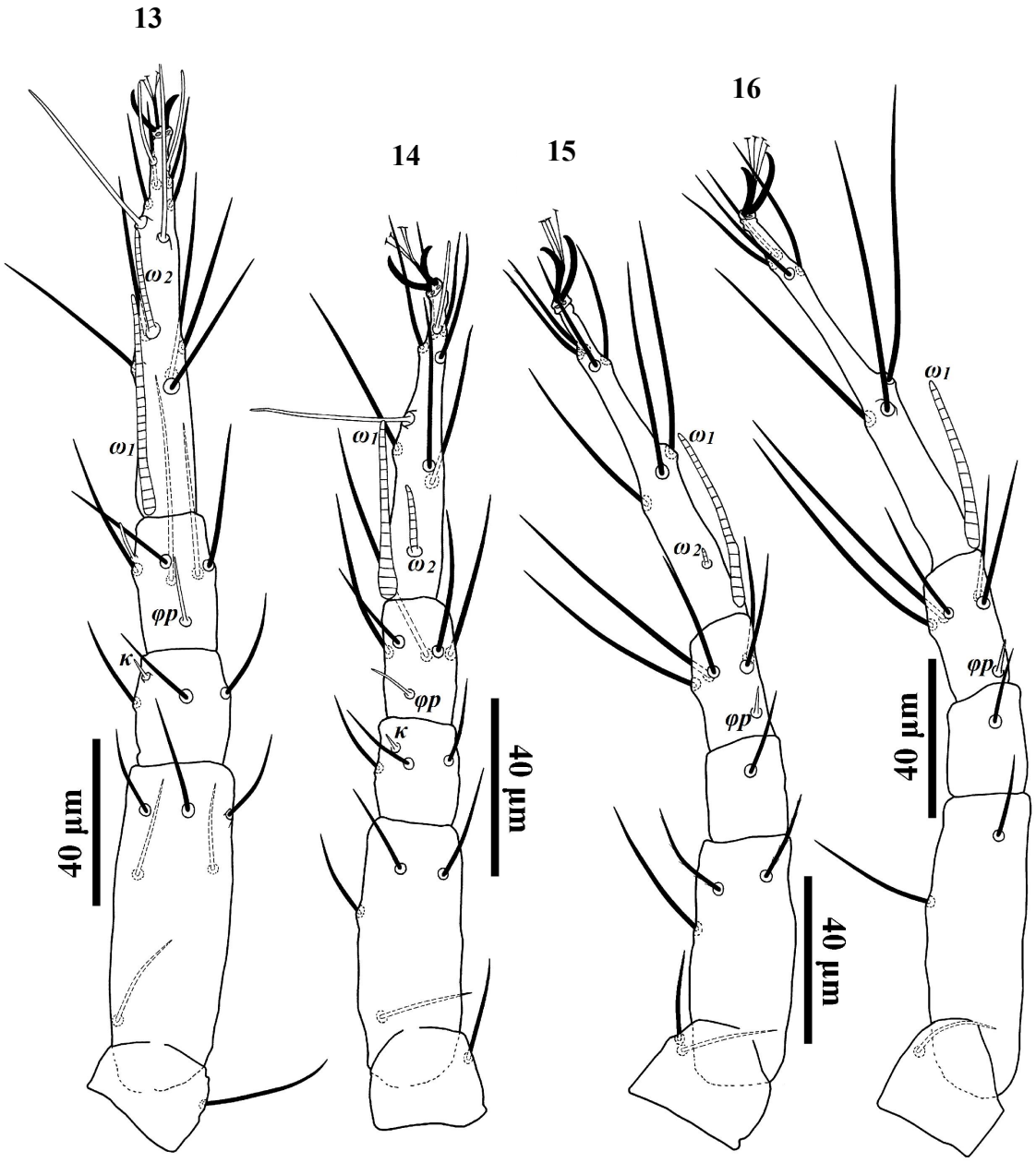
Male (n = 1) (Figs. 9–16) – Idiosoma oval. Length of body (including gnathosoma) 339, (excluding gnathosoma) 262; width 212.

Dorsum (Fig. 9) – Dorsal idiosoma covered with four shields (prodorsomal, metapodosomal, opisthosomal and suranal shields); prodorsal shield with four pairs of setae (*vi*, *ve*, *sci* and *sce*), and a pair of eyes 12, anterior to eyes with a few vacuoles; metapodosomal and opisthosomal shields smooth and separated incompletely, metapodosomal shield with three pairs of setae (c_1, d_{1-2}), opisthosomal shield with setae e_{1-2} and f_1 and suranal shield bears two pairs of setae (h_1, h_2), setae f_1 and h_2 longer than other dorsal setae. Dorsal setae serrated. Humeral shields smooth and bearing setae c_2 situated ventro-laterally. Lengths of dorsal setae: *vi* 18, *ve* 21, *sci* 15, *sce* 21, c_1 19, c_2 32, d_1 15, d_2 16, e_1 14, e_2 15, f_1 32, h_1 23, h_2 33. Distances between dorsal setae*: vi–vi* 32*, ve–ve* 61, *sci–sci* 103, *sce–sce* 153, c_1–c_1 59, c_2–c_2 194, d_2–d_2 153, d_1–d_1 53, e_1–e_1 61, e_2–e_2 99, f_1–f_1 63, h_1–h_1 33, h_2–h_2 47, h_1–h_2 9, d_1–d_2 54, e_1–e_2 28, d_2–e_2 54, c_1–d_1 49, d_1–e_1 46, e_1–f_1 29, f_1–h_1 42, *vi*/*vi*–*vi* 0.56, c_1/c_1–c_1 0.32, d_1/d_1–d_1 0.28, e_1/e_1–e_1 0.23, f_1/f_1–f_1 0.51, h_1/h_1–h_1 0.70, h_2/h_2–h_2 0.70, h_1/h_2. 0.69, c_1–c_1*: *d_1–d_1*: *e_1–e_1*: *f_1–f_1* 0.94: 0.84: 0.97: 1.0.



Figures 9–12. *Ledermuelleriopsis aminiae* **sp. nov.** (male) – 9. Dorsal view of idiosoma; 10. Ventral view of idiosoma and subcapitulum; 11.Aedaegus; 12. Palp.

Venter (Figs. 10, 11) – Ventral cuticle with transverse striae between coxae II and III. Coxisternal shields between coxae I-II, III-IV fused at midline and smooth (Fig. 10). Length of setae *la* 19, *1b* 24, *1c* 17, *2b* 18, *2c* 17, *3a* 18, *3b* 19, *3c* 17, *4a* 17, *4b* 17, *4c* 17, ag_1 18, ag_2 23, ps_1 4, ps_2 8, ps_3 13. Aggenital area with two pairs of setae ($ag_{1–2}$); pseudanal setae ($ps_{1–3}$) set on the prominent tubercles (Fig. 9). Aedeagus indicated in figure 11.



Figures 13–16. *Ledermuelleriopsis aminiae* **sp. nov.** (male) –13. Leg I; 14. Leg II; 15. Leg III; 16. Leg IV.

Gnathosoma (Figs. 10, 12) – Subcapitulum (67) with two pairs of subcapitular setae, *n* 17, *m* 21, two pairs of adoral setae or_1 13, or_2 16. Chelicerae: fixed digit 66, almost two times longer than movable digit 35 (Fig. 9). Palp five segmented, palp tarsus with four simple setae, one solenidion (ω 8) and two eupathidia (one simple and a tridentate); palp tibia with two setae, one well developed claw and one seta-like accessory claw; palp genu with one dorsal seta and one ventral seta; palp femur with three setae (Fig. 12).

Legs (Figs. 13–16) – Lengths: leg I 223; leg II 186; leg III 190, leg IV 222. Setal formulae of Leg segments (solenidia in parentheses and not included in setal counts) as follows: coxae 2-2-2-2; trochanters 1-1-2-1; femora 6-4-3-2; genua 3(+*κ*)-3(+*κ*)-1-1; tibiae 5(+*φ*, +*φp*)-5(+*φp*)-5(+*φp*)-5(+*φp*); tarsi 13(+ω_1 + ω_2)-9(+ω_1+ ω_2)-7(+ω_1 + ω_2)-7(+ω_1). Length of solenidia: Iω_1 53, Iω_2 25, IIω_1 40, IIω_2 15, IIIω_1 40, IIIω_2 4, IVω_1 43, IVω_2 5–7. I*φρ* 16, I*φ* 10, II*φρ* 11, III*φρ* 8, IV*φρ* 8, I*κ* 5, I *κ* 4.

Etymology

The new species is named in honor of Ms. Fatemeh Amini, who kindly helped senior author in field collection.

Material examined

Holotype female and two paratype females, and one paratype male were collected from soil under oak trees, *Quercus brantii* Lindl. (Fagaceae), Iran: Markazi province, Karchan (49º 53′ N, 34º 8′ E, and altitude 1670 m a.s.l.), 21 May 2015 by F. Amini. All specimens are deposited in the Collection of Acarology Laboratory, University of Bu-Ali Sina, Hamadan, Iran.

Immature stages – Unknown.

Remarks

The new species *Ledermuelleriospsis aminiae* **sp. nov.** resembles *L. indiscretus* Dönel & Doğan, 2011 in that anterior and lateral of idiosoma with pits and vacuoles, metapodosomal and opisthosomal shield separated incompletely, femora I-II with 6-4 setae and genua I-II with 3(+*k*). However it differs from the latter in: humeral shields divided anteriorly in the new species *vs.* undivided in *L. indiscretus*; coxisternal shield punctuate in the new species instead of reticulated in *L. indiscretus*; humeral shield punctated in *L. aminiae* instead of with pits and vacuoles in *L. indiscretus* and setae *ve* 26 (26–27), c_2 40 (34–41), h_1 28 (25–27), h_2 26 (27–29) in the new species instead of *ve* 13 (10–15), *c*2 23 (20–27), *h*1 13 (10–15), *h*2 15 (10–18) in *L. indiscretus.*

The new species also corresponds *L. bisetalis* Doğan, 2004, in having aggenital shield with three pairs of setae, metapodosomal and opisthosomal shield separated incompletely and femora I-II with 6-4 setae and genua I-II with 3(+*k*). However, *L. aminiae* differs from the latter in anterior and lateral of idiosoma with pits and vacuoles, almost medially smooth instead of completely covered with reticulate patterns formed by collected vacuoles in *L. bisetalis*, dorsal setae *vi*-e_2 longer, *vi* 23 (21–22), *ve* 26 (26–27), *sci* 20 (21), *sce* 24 (23–24), c_1 23 (21–23), c_2 40 (34–41), d_1 24 (21–23), d_2 23 (21), e_1 24 (22–24), e_2 23 (21–22) instead of shorter, *vi* = *ve* 17, *sci* = *sce* 15, $c_1 = d_1$ 10, c_2 17, $d_2 = e_1 = e_2$ 13 and humeral and suranal shields with punctuation in *L. aminiae* in contrast reticulated pattern with vacuoles in *L. bisetalis*; humeral shields divided anteriorly in the new species *vs.* not divided in *L. bisetalis.*

Also *Ledermuelleriospsis aminiae* **sp. nov.** resembles *L. incisa* Wood, 1967 in having incised dorsal shield. However, it differs from the latter in: metapodosomal and opisthosomal shields incorporated and with incised laterally versus completely separated *L. incisa*; prodorsal shield without incisions in new species instead of with lateral incisions in *L. incisa*; humeral shields divided anteriorly opposed to typical for the group *L. incisa.*

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توصیف گونهٔ جدیدی از کنه‌های جنس *Ledermuelleriopsis* (Acari: Stigmaeidae) از استان مرکزی، ایران

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چکیده

گونه جدیدی از جنس *Ledermuelleriopsis*، به نام *L. aminae* **sp. nov.** بر پایهٔ نمونه‌های یافت شده جنس‌های نر و ماده آن از خاک زیر درختان بلوط از منطقه کارچان شهرستان اراک در استان مرکزی، ایران، توصیف و ترسیم شد.

واژگان کلیدی: توصیف؛ کنه؛ تاکسون جدید؛ شکارگر؛ بندپایان کوچک.

اطلاعات مقاله: تاریخ دریافت: ۱۳۹۶/۲/۲۰، تاریخ پذیرش: ۱۳۹۶/۴/۲، تاریخ چاپ: ۱۳۹۶/۴/۲۴