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.

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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 BX51 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 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 aminia sp. nov. (Figs. 1–16)

Diagnosis (female)
Anterior and lateral of idiosoma with large pits and vacuoles, metapodosomal and opisthosomal shields separated incompletely, setae f1 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 (1k) 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 (prodorsal, 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 (c1, d1–2), opisthosomal shield with setae e1–2 and f1 and suranal shield bears two pairs of setae (h1, h2). Dorsal setae clavate and spinose. Humeral shields divided anteriorly (anterior small and posterior large) (Fig. 2), punctuated and bearing setae c2 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), ci 23 (21–23), c1 40 (34–41), di 24 (21–23), d1 23 (21), ei 24 (22–24), e1 23 (21–22), f1 28 (27–28), h1 28 (25–27), h2 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), c1–c1 78 (70–86), c2–c2 196 (198–201), d1–d1 199 (191–214), d1–di 76 (76–79), e1–e1 61 (56–72), e2–e2 156 (141–142), f1–f1 82 (79–91), h1–h1 39 (37–39), h2–h2 87 (71–90), d1–d2 70 (63–74), e1–e2 54 (49–54), h1–h2 25 (21–27), d2–e2 72 (63–79), c1–d2 63 (56–69), d1–e1 63 (60–72), e1–f1 49 (43–52), f1–h1 33 (24–43), vi–vi 0.52 (0.44–0.48), c1/c1–c1 0.30 (0.27–0.30), d1/d1–d1 0.31 (0.28–0.29), e1/e1–e1 0.39 (0.33–0.39), f1/f1–f1 0.34 (0.31–0.34), h1/h1–h1 0.72 (0.67–0.69), h2/h2–h2 0.30 (0.32–0.38), h1/h2 1.08 (0.92–0.93), c1–c1: d1–d1: e1–e1: f1–f1: 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: la 21 (20–21), lb 22 (23–25), lc 18 (17–19), lb 19 (18–19), lc 19 (18–21), la 21 (20–23), lb 18 (18–20), lc 17 (16–19), la 14 (16–18), lb 16 (14–18), lc 16 (13–17), ag1 14 (13–15), ag2 15 (14–16), ag3 16 (15–19), ps1 19 (21–22), ps2 20 (17–21) and ps3 17 (16–22). Distances: 1a–1a 28 (28–33), 3a–3a 40 (41–45), 4a–4a 28 (25–32), ag1–ag1 25 (17–23), ag2–ag2 50 (42–55), ag3–ag3 41 (37–46), ps1–ps1 16 (10–22), ps2–ps2 26 (19–31), ps3–ps3 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\textsubscript{1} 17 (15–16), or\textsubscript{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).


A NEW SPECIES OF LEDERMUellerIOPsis (ACARI: STIGMAEIDAE)
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: Iω 24 (23–29), IIω 16 (14–18), IIIω 4 (3–4), Iφp 16 (15–18), Iφ 10 (9–11), IIφp 11 (10–13), IIIφp 6 (6–9), IVφp 7 (7–8), Iκ 5 (4–5), IIκ 4 (3–4).


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 (c₁, d₁-2), opisthosomal shield with setae e₁,2 and f₁ and suranal shield bears two pairs of setae (h₁, h₂), setae f₁ and h₂ longer than other dorsal setae. Dorsal setae serrated. Humeral shields smooth and bearing setae c₂ situated ventro-laterally. Lengths of dorsal setae: vi 18, ve 21, sci 15, sce 21, c₁ 19, c₂ 32, d₁ 15, d₂ 16, e₁ 14, e₂ 15, f₁ 32, h₁ 23, h₂ 33. Distances between dorsal setae: vi–vi 32, ve–ve 61, sci–sci 103, sce–sce 153, c₁–c₁ 59, c₂–c₂ 194, d₁–d₂ 153, d₁–d₁ 53, e₁–e₁ 61, e₂–e₂ 99, f₁–f₁ 63, h₁–h₁ 33, h₂–h₂ 47, h₁–h₂ 9, d₁–d₂ 54, e₁–e₂ 28, d₁–d₁ 54, c₁–d₁ 49, d₁–e₁ 46, f₁–f₁ 29, f₁–h₁ 42, vi/vi–vi 0.56, c₁/c₁–c₁ 0.32, d₁/d₁–d₁ 0.28, e₁/e₁–e₁ 0.23, f₁/f₁–f₁ 0.51, h₁/h₁–h₁ 0.70, h₂/h₂–h₂ 0.70, h₁/h₂ 0.69, c₁–c₁: d₁–d₁: e₁–e₁: f₁–f₁ 0.94: 0.84: 0.97: 1.0.


**A NEW SPECIES OF LEDERMUELLERIOPSIS (ACARI: STIGMAEIDAE)**
Venter (Figs. 10, 11) – Ventral cuticle with transverse striae between coxae II and III. Coxi-sternal shields between coxae I-II, III-IV fused at midline and smooth (Fig. 10). Length of setae la 19, lb 24, lc 17, 2b 18, 2c 17, 3a 18, 3b 19, 3c 17, 4a 17, 4b 17, 4c 17, ag 18, ag 23, ps 4, ps 8, ps 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; trochanter 1-1-2-1; femora 6-4-3-2; genua 3(+κ)-3(+κ)-1-1; tibiae 5(φp)-5(φp)-5(φp)-5(φp)-5(φp); tarsi 13(+ω1 + ω2)-9(+ω1 + ω2)-7(+ω1 + ω2)-7(+ω1). Length of solenidia: Iω1 53, Iω2 25, IIω1 40, IIω2 15, IIIω1 40, IIIω2 4, IVω1 43, IVω2 5–7. Iφp 16, Iφ 10, IIφp 11, IIIφp 8, IVφp 8, Iκ 5, Iκ 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 (49° 53’ N, 34° 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(+κ). 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), c2 40 (34–41), h1 28 (25–27), h2 26 (27–29) in the new species instead of ve 13 (10–15), c2 23 (20–27), h1 13 (10–15), h2 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(+κ). 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-e2 longer, vi 23 (21–22), ve 26 (26–27), sc2 20 (21), sce 24 (23-24), c1 23 (21–23), c2 40 (34–41), d1 24 (21–23), d2 23 (21), e1 24 (22-24), e2 23 (21–22) instead of shorter, vi = ve 17, sce = sce 15, c1 = d1 10, c2 17, d2 = e1 = e2 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.

**REFERENCES**


A NEW SPECIES OF LEDERMUELLERIOPSIS (ACARI: STIGMAEIDAE)


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توصیف گونه جدیدی از کندهای جنس Ledermuelleriopsis (Acari: Stigmaeidae) از استان مرکزی، ایران

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چکیده
گونه جدیدی از جنس Ledermuelleriopsis به نام L. aminae sp. nov. به پایه نمونه‌های گرفته شده جنس‌های نر و ماده آن از خاک زیر درختان بلوط از منطقه کارچان شهرستان اراک در استان مرکزی، ایران مشخص و ترسیم شد.

واژگان کلیدی: توصیف؛ کن؛ تاکسون جدید؛ شکارگر؛ بندی‌بان کوچک

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