

## DESCRIPTION OF A NEW ANT-ASSOCIATED SPECIES (ACARI: MESOSTIGMATA: LAELAPIDAE) FROM IRAN

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**ABSTRACT** — A new species of laelapid mite of the genus *Myrmozercon*, *Myrmozercon iranicus* Babaeian and Nemati **n. sp.**, is described and illustrated based on adult female specimens collected in the nest of *Messor* sp., in Yazd and Shahrekord regions (Yazd and Chaharmahal and Bakhtiari provinces, respectively) of Iran.

**KEYWORDS** — Acari; Laelapidae; *Myrmozercon*; *Messor* sp.; Iran

### INTRODUCTION

Mites of the family Laelapidae Berlese are cosmopolitan; they have a wide ecological diversity including insect paraphages, parasites of vertebrates, and free-living predators inhabiting soil, litter habitats and nests of vertebrates and arthropods (Evans and Till, 1966; Strong and Halliday, 1994; Lindquist *et al.*, 2009). Nests of social insects provide habitats for diverse genera within the family Laelapidae such as *Holostaspis* Kolenati, *Laelaspis* Berlese, *Gymnolaelaps* Berlese and occasionally *Gaeolaelaps* Evans and Till and *Cosmolaelaps* Berlese (Lindquist *et al.*, 2009). Others such as the genus *Myrmozercon* have a more ambiguous association with their hosts.

The genus *Myrmozercon* is poorly known worldwide; it includes about 27 described species from Europe, Australia, Africa, Middle East, Transcaucasia, North America and Central Asia. Six species of

the genus are known from Iran (Baker and Strandtmann, 1948; Hunter and Hunter, 1963; Rosario and Hunter, 1988; Ueckermann and Loots, 1995; Walter, 2003; Shaw and Seeman, 2009; Joharchi *et al.*, 2011; Trach and Khaustov, 2011; Babaeian *et al.*, 2013; Ghafarian *et al.*, 2013; Joharchi and Moradi, 2013). In 1902, Berlese created the genus *Myrmozercon* and designated *M. brevipes* as its type species. Later, Berlese (1903, 1904) erected a second genus *Myrmonyssus* Berlese and sub-divided it into two subgenera, *Myrmonyssus* and *Laelaspulus* Berlese. *Myrmonyssus* and *Laelaspulus* were considered junior synonyms of *Myrmozercon* by Rosario and Hunter (1988) and Shaw and Seeman (2009). The most detailed diagnosis of *Myrmozercon* was provided by Shaw and Seeman (2009) and Joharchi and Moradi (2013). Casanueva (1993) revised the family Laelapidae based of phylogenetic analyses and included the genera associated with Hymenoptera (groups

III and IV) within the sub-family Melittiphidinae.

A new species of *Myrmozercon*, associated with *Messor* sp. (Hymenoptera: Formicidae) is described and illustrated in this paper.

## MATERIALS AND METHODS

Mite specimens were extracted from soil samples collected from the nest of an unidentified species of the genus *Messor* using Berlese-Tullgren funnels. Specimens collected were then cleared in Nesbitt's solution and mounted in Hoyer's medium. Measurements are presented in micrometers (µm) as: minimum-maximum or in a single value. Dorsal shield length and width were taken from anterior to posterior margins along the midline, and at broadest level, respectively. Length of the epigynal shield was measured along the midline from the posterior margin of the sternal shield to the posterior margin of epigynal shield, and the width at widest point. Length and width of the sternal shield were measured along the midline from its anterior to posterior margins and at the level of setae *st2*, respectively. Length of the anal shield was measured along the midline from its anterior to posterior margin including the cribrum (which is often folded under), and the width at the widest points. Length of legs was taken from the base of the coxa to the apex of tarsus, excluding the pretarsus. The second segment of the chelicera was measured from the base to the apex of the fixed digit. The length of the movable cheliceral digit was taken from the base to its apex. Setae were measured from the bases of their insertions to their tips. Idiosomal setal notation follows that of Lindquist and Evans (1965), the leg chaetotaxy that of Evans (1963a) and the palp chaetotaxy that of Evans (1963b). Idiosomal notation for glands and lyrifissures follows Johnston and Moraza (1991).

The holotype and two paratype specimens are preserved as permanent slides and deposited in the Jalal Afshar Zoological Museum, College of Agriculture, University of Tehran, Iran (JAZM) and one paratype specimen in the Acarological Collection, Acarological Society of Iran, Faculty of Agriculture, University of Tehran, Karaj, Iran.

## Genus *Myrmozercon* Berlese

*Myrmozercon* Berlese, 1902: 699. Type species *Myrmozercon brevipes* Berlese, 1902, by monotypy.

Diagnosis — The concept of *Myrmozercon* used here is based on that of Shaw and Seeman (2009) and Joharchi and Moradi (2013).

### *Myrmozercon iranicus* Babaeian and Nemati n.sp.

Specimens examined — Holotype and two paratype females, Iran, Yazd, Taft, 31°45'N 54°14'E, 25 Nov. 2013, O. Joharchi coll., in nest of *Messor* sp.. Paratypes, two females, Shahrekord County, Dotu region, 30 June 2010, E. Babaeian coll., in nest of *Messor* sp..

Diagnosis — Melittiphinae laelapid mites. Dorsal shield broad, not covering dorsal idiosoma, with 39 pairs of relatively long and barbed setae (excluding short and smooth setae *z1*): *j1-j6*, *J1-J5*, *z1-z6*, *Z1-Z5*, *s1-s6*, *S1-S5*, *Zx2-Zx3*, *r2-r5*. Two unpaired setae *Jx* present between *J2-J4*; epigynal shield posteriorly tapered. Post-stigmatal section of the peritrematal shield very elongate and extending well posterior to coxa IV to level of long metapodal shield.

Legs — Genu I and tibia I has three ventral setae, femur IV and genu IV with six and nine setae, respectively.

Description — Female (4 specimens). (Figures 1 and 2)

Dorsal idiosoma (Figure 1A) — Dorsal shield 464 – 482 long, 258 – 278 wide at level of *r3*, with reticulate pattern on the whole surface except median region, rounded posteriorly and does not completely cover idiosoma, with complement of 39 pairs of setae and two unpaired setae. Podonotal area of shield with 22 pairs (*j1-j6*, *z1-z6*, *s1-s6*, *r2-r5*) and opisthonotal area with 17 pairs (*J1-J5*, *Z1-Z5*, *S1-S5*, *Zx2*, *Zx3*), and two unpaired postero-median setae (*Jx*) between setae *J2-J4*; all setae (except *z1*) slightly thickened, distinctly barbed in apical third, and usually long enough to pass the base of the setae next behind, seta *z1* 10 – 12 shortest and smooth. Length of setae: *j1* 30 – 32, *s1*, *j2* 22 – 25, *j3*, *s2* 35 – 37, *z2*, *s3*, *r2* 40 – 42, *j4*, *z3*, *r3*, *s4*, *S1* 47 – 50, *z4*, *r4*, *r5*, *S2*, *J5* 52 – 54, *j5*, *z6*, *s5*, *s6* 58 – 60, *J1*, *J2*, *Z4*, *Z5*, *S3*,

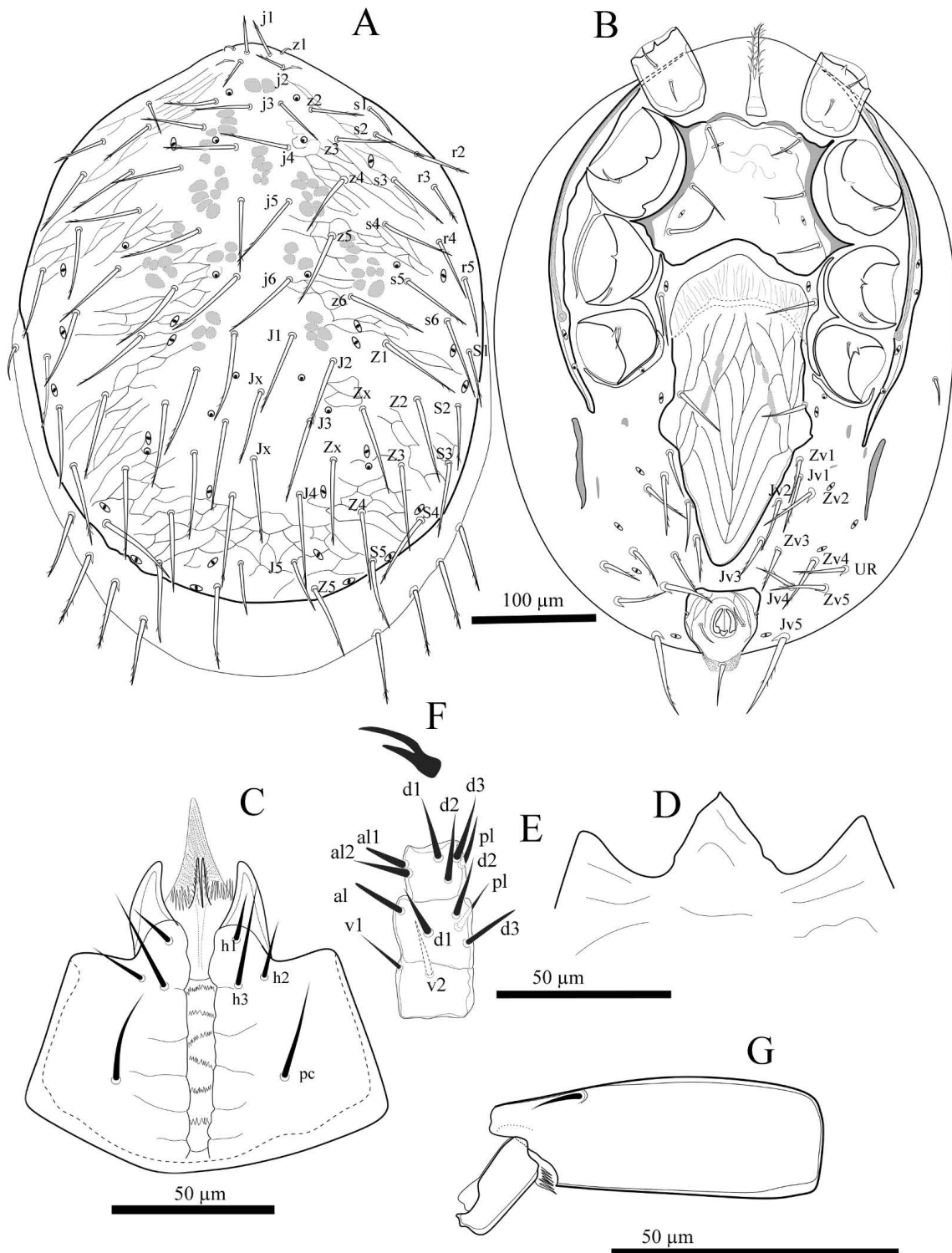


FIGURE 1: *Myrmozercon iranicus* Babaëian and Nemati **n. sp.**, female: A – Dorsal idiosoma; B – Ventral idiosoma; C – Gnathosoma; D – Epistome; E – Palp, right side (trochanter, femur and genu); F – Palp-tarsal apotele; G – Chelicera.

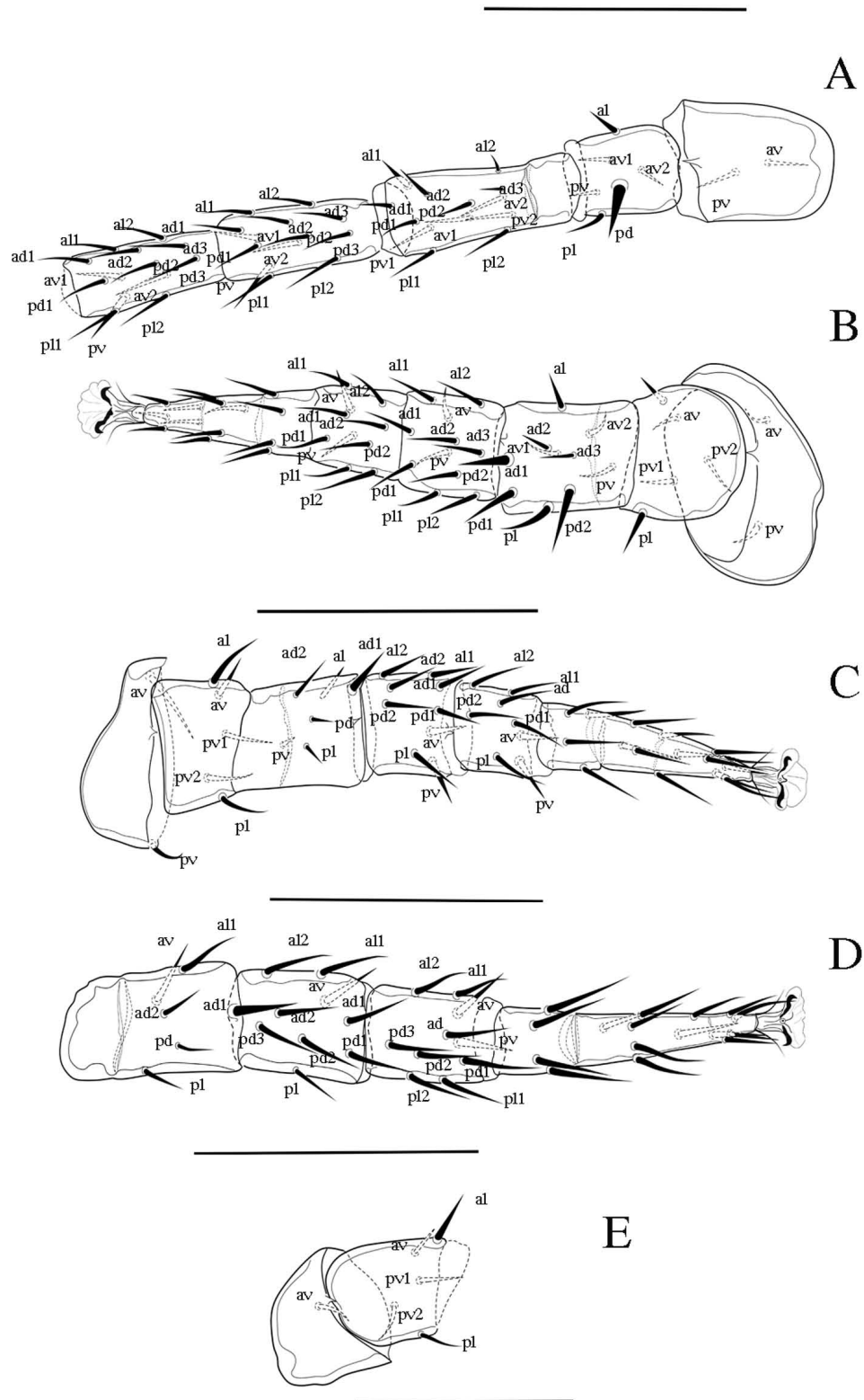


FIGURE 2: *Myrmozercon iranicus* Babaeian and *Nemat n. sp.*, female: A – Leg I, right side; B – Leg II, left side; C – Leg III, right side; D – Leg IV, right side; E – Coxa and trochanter IV, right side. Scale bare= 100 μm

*S4*, *S5* 62 – 64, *J3*, *J4*, *Z1*, *Z2*, *Zx2*, *Zx3* 65 – 67. Dorsal shield with complement of 20 discernible pore-like structures (7 podonotal, 13 opisthonotal), of which 7 (4 podonotal, 3 opisthonotal) appear secretory (gland pores) and 13 (3 podonotal, 10 opisthonotal) non-secretory (lyrifissures). Dorsal shield with smooth even edge.

Ventral idiosoma (Figure 1B) — Tritosternal base 33 long with two free pilose laciniae 46 long. Pre-sternal platelets absent. Sternal shield 83–85 long and 106 – 112 wide, finely lineate-reticulate anterolaterally, continuous with endopodal platelets between coxae I–II and II–III, anterior margin undulate, posterior margin strongly concave, bearing setae *st1*–*st3* smooth, thin and 39 – 44 long, and two pairs of lyrifissures (*iv1*–*iv2*), oriented angular. Metasternal setae *st4* 31 – 35 long and third pair of sternal lyrifissures (*iv3*) inserted on soft cuticle. Endopodal platelets between coxae III–IV narrow and anteriorly separate from sternal shield, and with small exopodal plates between coxae II–III. Epigynal shield 223 – 234 long and 88–91 wide, with conspicuous reticulation, with hyaline anterior margin, shield slightly inflated behind *st5* and tapered posteriorly. Paragenital lyrifissures (*iv5*) located on unsclerotised cuticle lateral to epigynal shield. Inguinal area with a pair of elongate and narrow metapodal plates, 70 – 75 long and 4 – 6 wide and a pair of small platelets; a pair of small paragenital platelets also present. Opisthogastric integument with 10 pairs of setae and five pairs of lyrifissures: *Jv1* 35 – 40, *Jv2* 40 – 42, *Jv3* 42 – 45, *Jv4* 52 – 55, *Jv5* 59 – 62, *Zv1* 32 – 42, *Zv2* 35 – 40, *Zv3* 40 – 42, *Zv4* 47 – 50, *Zv5* 57, each seta arising on a small platelet, *Zv1* and *Jv1* smooth, remaining setae barbed distally. Podal shields present with *gv2* gland pore. Anal shield sub-triangular and slightly concave anteriorly, 69 – 72 long and 56 – 58 wide, with faint striations in pre-anal region, post-anal seta 26 – 29 long, thicker and longer than para-anal setae 23 – 25, adanal gland pores *gv3* on lateral edges of the shield above para-anal setae, cribrum narrow and inserted on posterior margin. Peritremes 245 – 250 long, elongate and extending from stigmata at mid level of coxae III–IV to the posterior margin of coxa I, peritrematal shields with one pair of gland pores

at mid-level of coxa III, and one pair of lyrifissures near anterior level of coxa III, post-stigmatal section of peritrematal shield elongated, bearing lyrifissure *ip* and gland pore *gp3*.

Gnathosoma (Figures 1C–G) — Epistome sub-triangular with smooth margin (Figure 1D). Subcapitulum (Figure 1C): Hypostomal (*h1*, *h2*, *h3*) and capitular setae (*pc*) simple and smooth, 17 – 20, 19 – 21, 34 – 37 and 44 – 46 long, respectively. Deutosternal groove has six transverse rows of fine denticles (from anterior to posterior) 15–12–13–15–12–9 denticles in each row, respectively, in deutosternal groove of one paratype there are seven transverse rows of denticles; internal malae abutting and pointed apically, finely fringed laterally; labrum with pilose surface, extending to mid-level of palp-femur. Corniculi 16 – 18 long, weakly sclerotised, and flanked by a pair of thin salivary styli. Palps 83–87 long, with smooth setae, chaetotaxy of palps from trochanter to tarsus: 2–5–6–14–15, *v2* on trochanter thickened, *al1* on femur thickened and with narrowly rounded tip, palp-genu with seta *al1* rod-like and seta *al2* thickened and similar to *al1* on the femur, dorsal setae on femur, genu and tibia thickened, tarsus with simple and thickened setae (Figure 1E). Palp-tarsal apotele two-tined, basal tine slightly shorter (Figure 1F). Chelicerae (Figure 1G) with movable digit edentate, 19 – 21 long, fixed digit edentate, 11 – 12 long, with fringed hyaline arthrodial process at the base of the movable digit, middle segment 54 long, dorsal seta short.

Legs (Figures 2A–E) — Length of leg I 308 – 366, leg II 237 – 260, leg III 237 – 257, leg IV 324 – 386. Chaetotaxy (left and right sides of legs in all specimens were examined): Leg I: coxa 0 0/1 0/1 0, trochanter 1 0/2 1/1 1 (*pd* thickened, *al* slightly thickened), femur 2 3/2 2/2 2 (*al1* slightly thickened, *al2* short and simple), genu 2 3/2 3/1 2 (ventral setae slightly thickened), tibia 2 3/2 3/1 2 (ventral setae slightly thickened) (Figure 2A). Leg II: coxa 0 0/1 0/1 0, trochanter 1 0/1 0/2 1 (*al* and *pl* slightly thickened), femur 1 3/2 2/1 1 (*ad1* thickened, *pd1* and *pd2* slightly thickened), genu 2 3/1 2/1 2 (ventral setae slightly thickened), tibia 2 2/1 2/1 2 (ventral setae slightly thickened) (Figure 2B). Leg III: coxa 0 0/1 0/1 0 (*av* long), trochanter 1 0/1

0/2 1 (*al* thickened), femur 1 2/0 1/1 1 (*ad1* thickened, *pv* tiny thickened), genu 2 2/1 2/1 1 (*av* and *pv* slightly thickened), tibia 2 1/1 2/1 1 (*av* and *pv* slightly thickened) (Figure 2C). Leg IV: coxa 0 0/1 0/0 0, trochanter 1 0/1 0/2 1 (*al* thickened) (Figure 2E), femur 1 2/1 1/0 1 (*ad1* thickened), genu 2 2/1 3/0 1 (*av* slightly thickened), tibia 2 1/1 3/1 2 (*av* and *pv* slightly thickened) (Figure 2D). Other setae are fine and needle like. Tarsi II-IV with 18 setae 3 3/2 3/2 3 + *mv*, *md*. All legs with two tiny claws and a rounded membranous pulvillus.

**Etymology** — The name "*iranicus*" is referred to the country of origin (Iran) where the type specimens were collected.

**Notes** — According to the key to species of *Myrmozercon* occurring in the Palaearctic Region presented by Joharchi and Moradi (2013), *M. iranicus* Babaeian and Nemati **n. sp.**, keys out to *Myrmozercon michaeli* Joharchi, 2013 (dorsal shield hypotrichous and truncated, peritreme long, metasternal setae *st4* present and almost all dorsal setae barbed in apical end).

It is interesting to note that these two species of *Myrmozercon* were collected in the nest of an unidentified species of *Messor*, and in nearly similar geographical locations.

The two species are very similar, the only obvious differential characters being the body size (Idiosoma length  $\times$  width of five female *M. iranicus* Babaeian and Nemati **n. sp.** c. 450 – 488  $\times$  337 – 348, while those of eight *M. michaeli* c. 560 – 580  $\times$  372 – 446), the shape of idiosoma (broad in *M. iranicus* Babaeian and Nemati **n. sp.**, but oval in *M. michaeli*), length of peritreme (longer and reaching to posterior margin of coxa I in *M. iranicus* Babaeian and Nemati **n. sp.**, but shorter and reaching to mid-level of coxa II only in *M. michaeli*), the shape of the epigynal shield (cone-shaped, posteriorly pointed in *M. iranicus* Babaeian and Nemati **n. sp.**, but nearly tongue-shaped, with rounded posterior margin in *M. michaeli*), post-stigmatal section of peritrematal shield (elongate, extending well behind exopodal shield and reaching to metapodal shield in *M. iranicus* Babaeian and Nemati **n. sp.**, but shorter and not reaching to posterior margin of coxa IV in *M. michaeli*), number of unpaired setae

(*Jx*) on the dorsal shield (two in *M. iranicus* Babaeian and Nemati **n. sp.**, but zero in *M. michaeli*), chaetotaxy of trochanter I, femur II, III and genu IV (1 0/2 1/1 1, 1 3/2 2/1 1, 1 2/0 1/1 1 and 2 2/1 3/0 1 in *M. iranicus* Babaeian and Nemati **n. sp.**, but 1 1/2 0/1 1, 2 3/1 2/2 1, 1 2/1 1/0 1 and 2 2/1 3/0 2 in *M. michaeli*, respectively), seta *pd1* on femur II (slightly thickened in *M. iranicus* Babaeian and Nemati **n. sp.**, but thickened in *M. michaeli*) and setae *pl* and *pd* on trochanter I (*pd* thickened in *M. iranicus* Babaeian and Nemati **n. sp.**, but *pl* thickened in *M. michaeli*). Characteristic ornamentation including  $\Delta$ -shaped lines and polygonal cells on the epigynal shield of the two species is also different (Joharchi and Moradi, 2013).

## DISCUSSION

So far, six species of *Myrmozercon* have been recorded from Iran, *M. karajensis* Joharchi, Halliday and Saboori, 2011 associated with *Camponotus* sp., *M. sternalis* Babaeian, Joharchi and Saboori, 2013 associated with *Formica* sp., *M. cyrusi* Ghafarian and Joharchi, 2013 associated with *Monomorium* sp., *Myrmozercon crinitus* Joharchi associated with *Pheidole pallidula* (Nylander), *M. michaeli* associated with *Messor* sp. and *Myrmozercon tauricus* Trach and Khaustov, 2011 associated with *Crematogaster schmidtii* (Mayr) (Joharchi *et al.*, 2011; Babaeian *et al.*, 2013; Ghafarian *et al.*, 2013; Joharchi and Moradi, 2013).

Defining the genus *Myrmozercon* as well as other melittiphine or hypoaspidine groups is difficult because of lack of apomorphies or autapomorphies.

Species of this genus share some characters: corniculi and cheliceral digits are short, fixed digit reduced, leg chaetotaxy highly variable and deutosternal groove has at least six rows of denticles. These features create a very heterogeneous genus with instability in several morphological characters: dorsal shield hypertrichous or hypotrichous; with free or fused sternal shield with endopodal plates between coxae III and IV; presence or absence of palp seta *v2* on palp-trochanter and short or elongate peritreme.

The leg chaetotaxy of *Myrmozercon* species shows some variation, with a reduction or increase in number of setae on some leg segments (usually femur, genu and tibia I or femur and genu IV). Although not enough is known about leg chaetotaxy in other species to be sure.

Species of *Myrmozercon* have host-specificity and their distribution may be influenced by their host specificity. At least ten genera of ants have been reported so far as hosts in the world and among them *Crematogaster*, *Camponotus* and *Messor* are the most common (Babaeian *et al.*, 2013). The biology of species of *Myrmozercon* has not been studied. Some species are often found clinging to the thorax, abdomen and head of the ants, but the ecological role of these species and nature of their relationship is not known. Joharchi *et al.*, (2011) and Joharchi and Moradi (2013) speculated that reduced peritreme, fixed cheliceral digit and weakly sclerotised corniculi in *Myrmozercon* indicate that they may be parasitic on its ant hosts.

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