

A NEW SPECIES OF MYRMOZERCON BERLESE (ACARI: MESOSTIGMATA: LAELAPIDAE) ASSOCIATED WITH ANT FROM IRAN

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(Received 26 July 2013; accepted 30 September 2013; published online 19 December 2013)

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ABSTRACT — *Myrmozercon sternalis* **n. sp.**, a new laelapid mite (Acari: Mesostigmata) is described and illustrated based on females collected in the nest of *Formica* sp. (Hymenoptera: Formicidae) in Karaj region, Iran. The new species differs from almost all other species in the genus by very elongate peritreme, distinctive and horse-shoe like of the sternal shield and also edentate cheliceral digits. The ecological role of *Myrmozercon* is not clear, but may be parasites of ants.

KEYWORDS — *Myrmozercon*; Laelapidae; *Formica* sp.; new species; taxonomy; Iran

INTRODUCTION

Mites of the family Laelapidae Berlese are cosmopolitan and have varying degrees of associations with both vertebrates and invertebrates (Evans and Till, 1966; Strong and Halliday, 1994; Lindquist *et al.*, 2009). The family has not yet achieved a consistent genus-level classification. The genera *Laelaspis* Berlese, *Holostaspis* Kolenati and *Gymnolaelaps* Berlese are considered to be Myrmecophiles (Hunter, 1961; Bregetova, 1977; Joharchi *et al.*, 2011). Others such as *Myrmozercon* Berlese, have a more ambiguous association with ants.

The genus *Myrmozercon* is reported from Europe, Australia, Africa, Middle East, Transcaucasia, North America and Central Asia. Berlese (1902) established the genus *Myrmozercon* and designated *M. brevipes* as its type species. Later, Berlese (1903, 1904), erected a second genus *Myrmonyssus* Berlese,

and proposed two subgenera, namely *Myrmonyssus* and *Laelaspulus* Berlese. Rosario and Hunter (1988) and Shaw and Seeman (2009) synonymised *Myrmonyssus* and *Laelaspulus* with *Myrmozercon*.

The genus *Myrmozercon* belongs to a smaller group of genera of laelapid mites and at present has about 26 species (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; Ghafarian *et al.*, 2013; Joharchi and Moradi, 2013).

During a survey to determine the diversity of laelapid species in Karaj region, in 2013, *Myrmozercon sternalis* **n. sp.** was found in the nest of *Formica* sp. The new species has raised the number of known species of this genus from Iran to five.

MATERIALS AND METHODS

Mites were extracted from samples using Berlese-Tullgren funnels, then cleared in Nesbitt's fluid and finally mounted in Hoyer's medium on microslides (Walter and Krantz, 2009). The line drawings and examinations of the specimens were performed with an Olympus BX51 phase contrast microscope equipped with a drawing tube. Measurements are presented in micrometers (μm) as follows: minimum-maximum. Dorsal shield length and width were taken from anterior to posterior margins along the midline, and in broadest width point, respectively. Length and width of the sternal shield were measured from the most anterior point to the most posterior point and at the broadest point, respectively. Genital shield length and width were measured along the midline from posterior margin of the sternal shield to the posterior acute margin, and at level of setae *st5*, respectively. Anal shield was measured along the midline from anterior to the posterior margin of cribrum (which is often folded under), and the width at widest point. Peritreme length was measured from the base of the stigma to the its end (post-stigmatal section). Leg lengths were measured from base of the coxa to the apex or tarsus without the pretarsus. Total cheliceral length was taken from its base to the apex of the movable digit. Fixed and movable cheliceral digits length were taken from the base of movable digit to their each tips. Idiosomal setal notation followed that of Lindquist and Evans (1965) and leg and palp chaetotaxy follows that of Evans (1963 a,b). Idiosomal notation for glands and lyrifissures follows Johnston and Moraza (1991).

The holotype and two paratypes are preserved as permanent slides and deposited in the Acarological Collection, Jalal Afshar Zoological Museum, Faculty of Agriculture, University of Tehran, Karaj, Iran (JAZM), two paratypes in the Acarological Collection, Acarological Society of Iran, Faculty of Agriculture, University of Tehran, Karaj, Iran, two paratypes in the Australian National Insect Collection, CSIRO Ecosystem Sciences, Canberra ACT, Australia (ANIC).

Genus *Myrmozercon* Berlese

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

Myrmonyssus Berlese, 1903: 16. Type species *Myrmonyssus diplogeni* Berlese, 1903, designated by Berlese, 1904 (synonymy by Rosario and Hunter, 1988).

Myrmonyssus (Laelaspulus) Berlese, 1904: 437. Type species *Myrmozercon acuminatus* Berlese, 1903, by original designation (synonymy by Shaw and Seeman, 2009).

Parabisternalis Ueckermann and Loots, 1995: 35. Type species *Parabisternalis yemeni* Ueckermann and Loots, 1995, by original designation (synonymy by Shaw and Seeman, 2009).

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

Myrmozercon sternalis n. sp.
(Figures 1 – 3)

Specimens examined — Holotype, female, Iran, Karaj, Najm Abad, 35°52' N, 50°30' E, alt. 1124 m a.s.l., 9 March 2013, E. Babaeian coll., in the nest of *Formica* sp.. Paratypes, seven females, same data as holotype.

Diagnosis — Mellitiphine laelapid mites. Dorsal shield oval shaped, truncated posteriorly and does not completely cover idiosoma, with 38 pairs of setae and one unpaired setae, all setae (excluding *j1*) long and barbed; sternal shield deeply concave anteriorly, horse-shoe like and free of narrow endopodal shields; genital shield narrow posteriorly; peritremes long, fixed and movable digits without teeth; epistome with serrate anterior margin and femur IV with five setae.

Description — Female

Dorsal idiosoma (Figure 1A) — Length 626 – 653, dorsal shield length 596 – 619, width 450 – 505 ($n = 6$), oval, truncate at posterior region and not covering entire idiosoma, with reticular pattern on the whole surface, with complement of 38 pairs of setae, and one unpaired postero-median (*Jx*): 21 pairs (*j1-j6*, *z1-z6*, *s1-s5*, *r2-r5*) in podonotum and 17 pairs (*J1-J5*, *Z1-Z5*, *S1-S5*, *Zx2-Zx3*) in opistonotum and

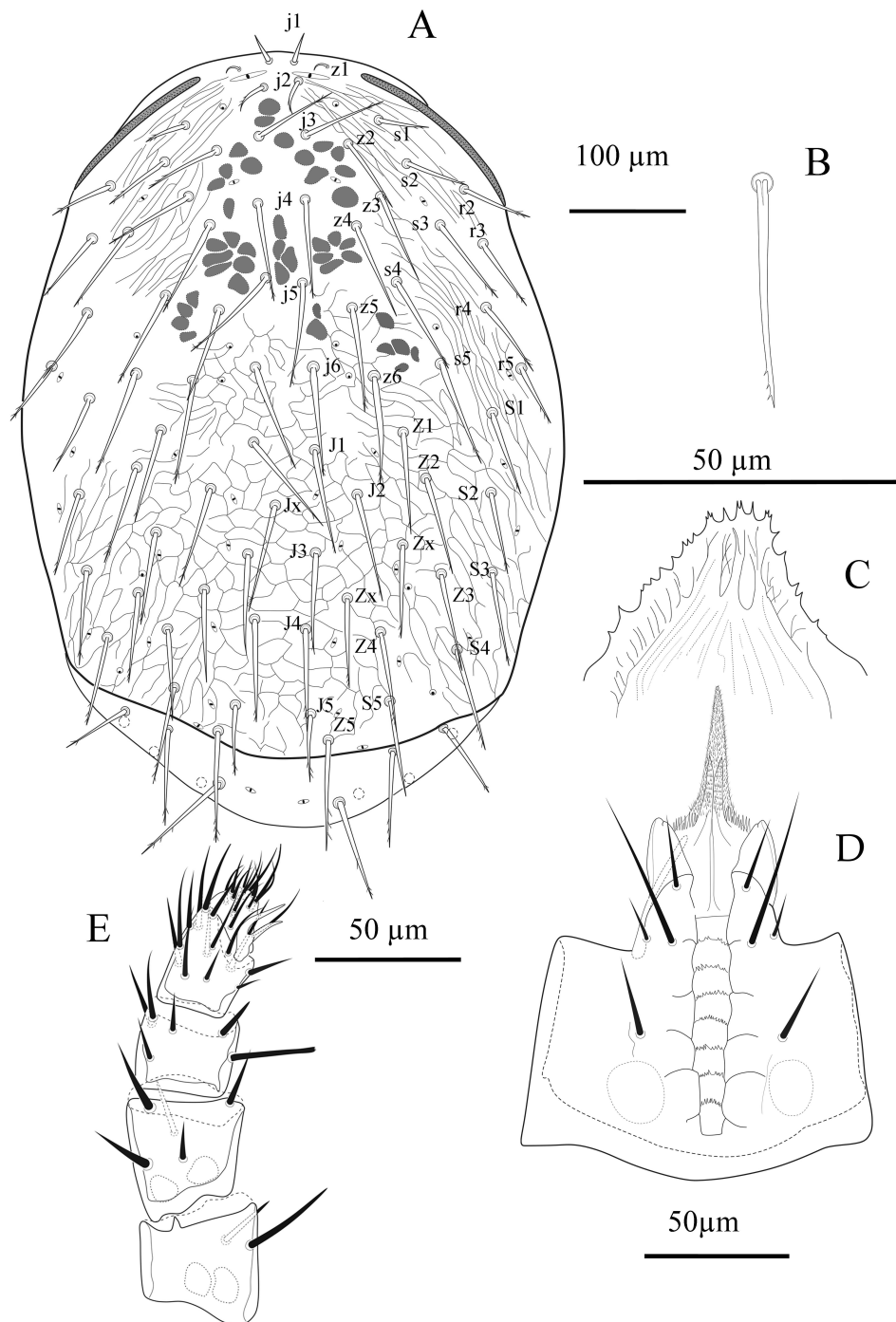


FIGURE 1: *Myrmozercon sternalis* n. sp.: A – dorsal shield; B – detail of a dorsal seta, not to scale; C – epistome; D – subcapitulum; E – palp.

one additional unpaired setae between *J2*-*J3*; three pairs of R setae in soft skin posterior to shield, all setae long, thickened and barbed apically (Figure 1B), posterior setae longer than anterior ones and extending well behind the base of next posterior seta. Shield with 21 pairs of pore-like structures, apparently including six pairs of gland pores and 15 pairs of poroids; posterior soft integument with a pair of lyrifissures, lyrifissures near the base of *j1* large and slit-like, others smaller and ovoid.

Ventral idiosoma (Figure 2A) — Tritosternal base narrow 27 – 37 long, and with pilose paired lacinia 67 – 79 (Figure 2C); presternal platelets absent, sternal shield 25 long along midline, with a few lines, distance between the most anterior point to the most posterior point 176 – 183, 200 – 208 width at widest point, and fused with endopodal extension between coxae I-II and II-III; with strongly concave anterior margin, bearing setae *st1-st3* smooth, thin and 50 – 54, 47 – 56, 45 – 50 long respectively, with two pairs of lyrifissures, oriented obliquely; *st4* 50 – 52 and third pair of lyrifissure on soft cuticle. Endopodal plates beside coxae III and IV, narrow and separate from sternal shield. Narrow exopodal plates enclosing coxa IV posteriorly, *gv2* in soft cuticle and small parapodal plate between coxa II-III (not illustrated). Genital shield with conspicuous reticulation, 262 – 277 long and 131-141 wide (along midline and at level of *st5* respectively, with hyaline and lineate anterior margin, tapered toward the apex and pointed posteriorly, with eight longitudinal cells in the central area bordered by two lines forming an inverted-V, bearing *st5* 45 – 57 on lateral edges, greatest width a little behind *st5*, lyrifissure *iv5* located on soft cuticle anteromedial to exopodal shield. Metapodal shields narrow, 34 – 40 long and 6 – 8 wide, two small paragenital platelets beside seta *Zv1*. Opisthogaster with five pairs of lyrifissures and 11 pairs of heterogeneous setae, each seta arising on small and rounded platelet, *Zv1* and *Jv2* are smooth setae, remaining setae barbed distally. Anal shield sub-triangular and straight anteriorly, 134 – 144 long and 84 – 92 wide, ornate with faint striations in pre-anal region, post-anal seta 74 – 79 thickened, about two times longer than para-anal setae 34 – 45, adanal gland pores *gv3* on lateral

edges of the shield, near posterior margin of anus, cribrum narrow and inserted on posterior margin, anus large and anterior to flanking para-anal setae. Peritremes long, narrow, 309 – 349 long, extending from stigmata at mid-level of coxae III-IV, extending to level of *z1*, peritrematal plates smooth, free posteriorly and fused to dorsal shield near *s1*, bearing three pairs of gland pores *gp* and three pairs of lyrifissures *iv*, post-stigmatal section elongate, 55 – 73 long, bearing gland pore *gp3* and two *ip* (Figure 2B).

Gnathosoma (Figures 1C-E, 2D) — Epistome triangular, with denticulate anterior margin (Figure 1E). Subcapitulum (Figure 1D): hypostomal (*hp1*, *hp2*, *hp3*) and capitular setae simple, smooth, 15 – 18, 13 – 17, 42 – 47 and 27 – 32 long, respectively; deutosternal groove with seven rows of denticles, rows progressively widened from the base to the end, preceded anteriorly by a smooth ridge; internal malae slender, abutting and pointed apically, finely fringed, extending beyond anterior margin of corniculi; external malae with nine or eleven points; labrum slender, with pilose surface. Corniculi short, membranose and bilobed at tip, 22 – 27 long. Salivary stili thin, distinct and slightly thicker basally. Chelicerae (Figure 2D) with middle segment 99 – 114 long ending in fixed digit 30 – 32, with movable digit edentate, 37 long from base to tip, with fringed arthrodial corona; fixed digit edentate, with only a large, blunt tooth near its base, 32 long, total length 166 – 173; pilus dentilis absent; dorsal seta smooth, posteriad dorsal lyrifissure; anti-axial lyrifissure long. Palpi (Figure 1E) 140 – 156 long, with normal setation (2-5-6-14-15); palptarsal apotele two-tined, ventral tine slightly shorter than dorsal tine (Figure 1E); palp trochanter with lateral seta longer, 1.6 times longer than the other seta on the segment; palp genu seta *al1* thickened, *al2* thickened and apically trifurcate (Figure 1E).

Legs — Legs I-IV (Figures 3A-D) with well developed claws and pulvilli; all setae smooth. Leg I very elongate, 705 – 668 long, legs II-IV 438 – 465, 448 – 455 and 606 – 629 long, respectively. Setation of legs: Leg I: coxa 0 0/1 0/1 0, trochanter 1 0/2 1/1 1 (*pd* thickened), femur 2 3/1 2/1 2 (*ad3* thin, *ad1* thickened), genu 2 3/2 3/1 2, tibia 2 3/2 3/1 2 (Fig-

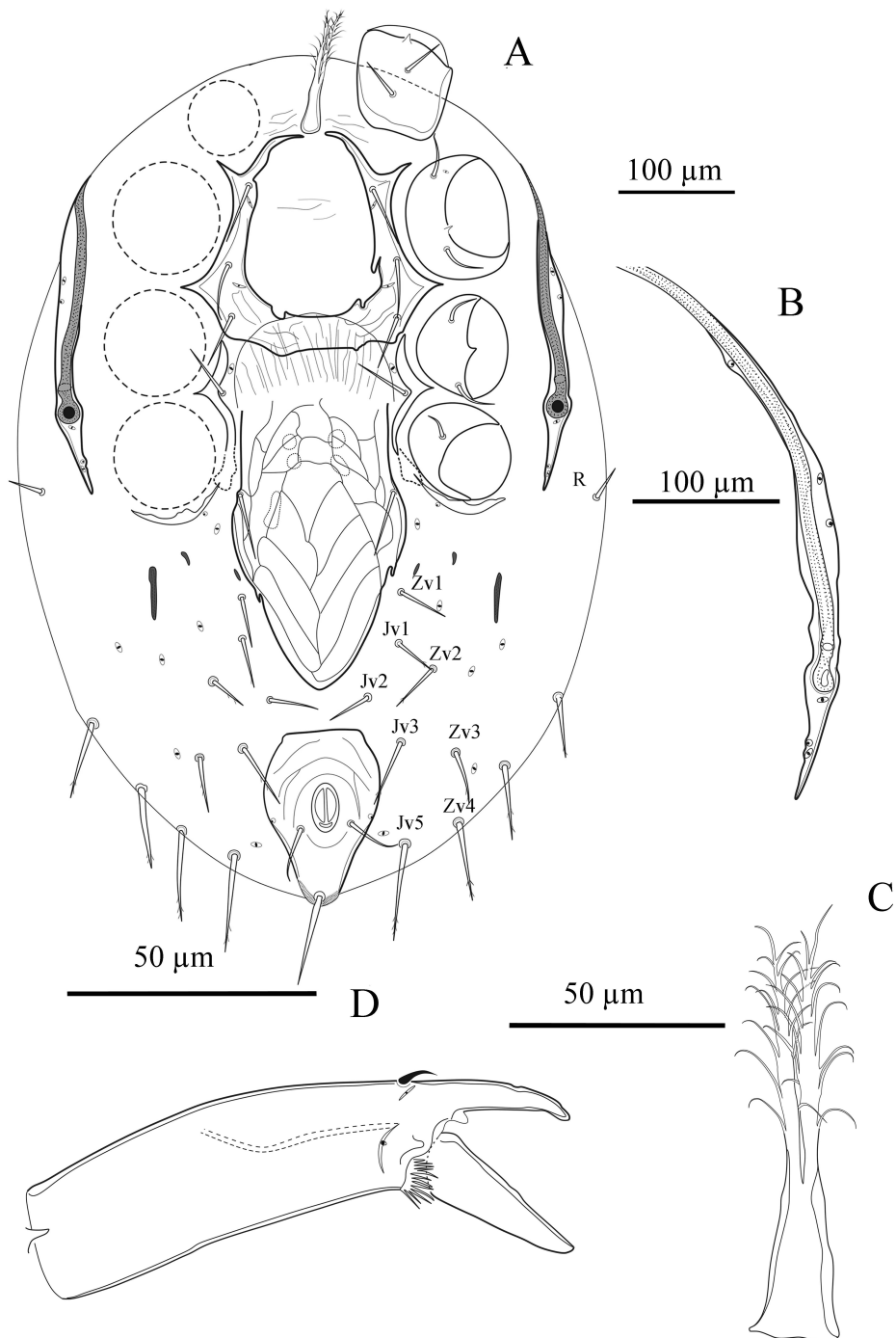


FIGURE 2: *Myrmozercon sternalis* n. sp.: A – ventral shield; B – detail of peritrematal plate; C – tritosternum; D – chelicera.

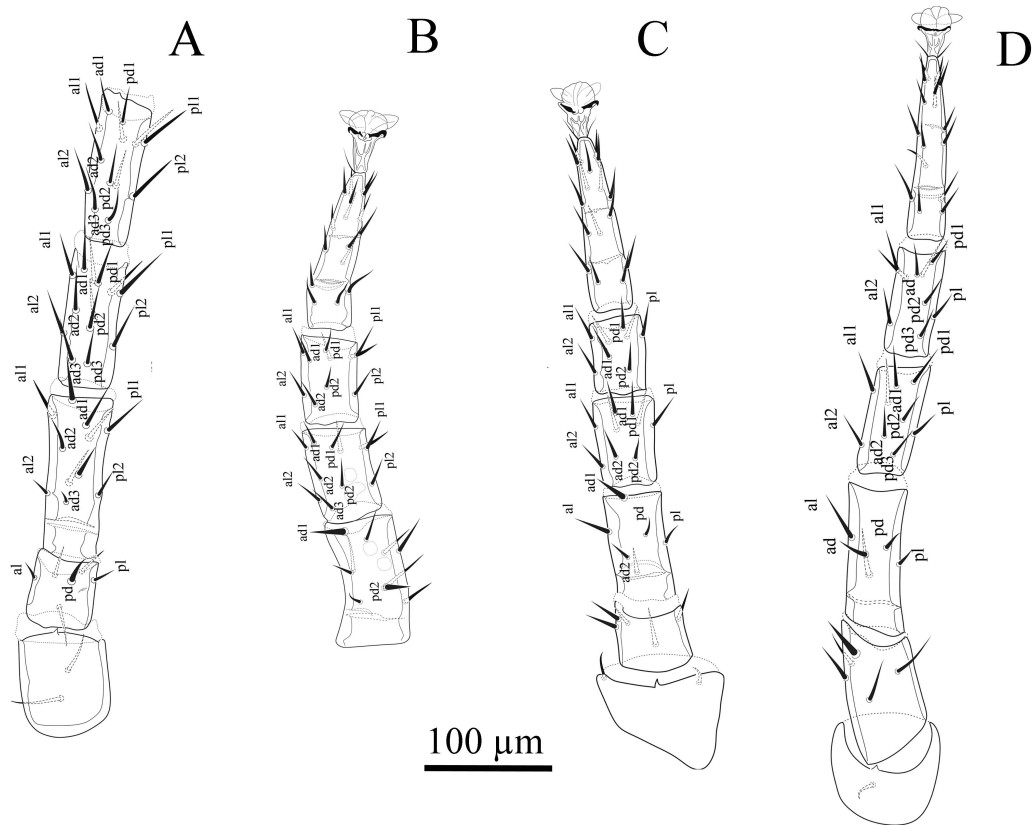


FIGURE 3: *Myrmozercon sternalis* n. sp.: A – leg I, dorsal aspect; B – leg II, dorsal aspect; C – leg III, dorsal aspect; D – leg IV, dorsal aspect.

ure 3A). Leg II: coxa 0 0/1 0/1 0, trochanter 1 1/0 0/2 1, femur 2 3/1 2/1 1 (*ad1* thickened, *pd2* slightly thickened), genu 2 3/1 2/1 2 (*av* and *pv* slightly thickened), tibia 2 2/1 2/1 2 (*av* and *pv* slightly thickened) (Figure 3B). Leg III: coxa 0 0/1 0/1 0, trochanter 1 1/1 0/1 1 (*al* and *ad* thickened), femur 1 2/1 1/0 1 (*al* slightly thickened, *ad1* 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 3C). Leg IV: coxa 0 0/1 0/0 0, trochanter 1 1/1 1/0 1 (*al* slightly thickened, *ad* thickened), femur 1 1/0 1/0 1 (*al*, *ad* and *av* slightly thickened), genu 2 2/1 3/0 1 (*av* thickened), tibia 2 1/1 3/1 1 (*av* and *pv* slightly thickened) (Figure 3D). Tarsi II-IV with 18 setae (3 3/2 3/2 3) + *mv*, *md*.

Etymology — The name of the new species "ster-

nalis" is derived from the distinctive shape of the sternal shield.

Notes — According to the key to species of *Myrmozercon* occurring in the Palaearctic Region presented by Joharchi and Moradi (2013), *Myrmozercon sternalis* n. sp. runs to *Myrmozercon michaeli* Joharchi, 2013 (dorsal shield hypotrichous and truncated, peritreme long, femur I with less than four ventral setae (including two ventral setae), metasternal setae *st4* present and almost all dorsal setae barbed in apical end). However, *M. sternalis* n. sp. differs from *M. michaeli* and other similar congeners by following combination of characters: (1) sternal shield deeply concave anteromedially and horse-shoe like; (2) dorsal shield setae thickened and elongated; (3) movable and

fixed digits completely edentate; (4) femur I with two ventral setae; (5) peritreme very long; (6) femur and genu IV each with five and nine setae, respectively.

DISCUSSION

Before the start of present study, five species of *Myrmozercon* had been recorded from Iran, *Myrmozercon crinitus* Joharchi, 2013 associated with *Pheidole pallidula* (Nylander), *M. cyrusi* Ghafarian and Joharchi, 2013 associated with *Monomorium* sp., *M. karajensis* Joharchi, Halliday and Saboori, 2011 associated with *Camponotus* sp., *M. michaeli* Joharchi, 2013 associated with *Messor* sp. and *Myrmozercon tauricus* Trach and Khaustov, 2011 associated with *Crematogaster schmidtii* (Mayr) (Joharchi *et al.*, 2011; Ghafarian *et al.*, 2013; Joharchi and Moradi, 2013). Species of *Myrmozercon* have host-specificity and their distribution may be influenced by their host specificity. According to Joharchi and Moradi (2013), nine genera of ants have been reported as hosts in the world and among them *Crematogaster*, *Camponotus* and *Messor* are the most common respectively, however *M. sternalis* n. sp. has been collected in association with *Formica* sp. and this is the first record of this genus as the ant host.

The morphological diversity of the *Myrmozercon* offers considerable challenges to its classification.

All the species included into this genus share some characters: corniculi and cheliceral digits are very short, fixed digit reduced, leg chaetotaxy highly variable and deutosternal groove has at least seven 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 and endopodal plates between coxae III-IV; presence or absence of *v2* on palp trochanter, chaetotaxy of some leg segments, short or long peritreme.

M. cyrusi, also lacks palp coxal setae and has similar chaetotaxy on genu I-IV that was not seen in other species of *Myrmozercon*. Species of the genus *Scissuralaelaps* Womersley and some *Haemogamasidae*, such as *Haemogamasus pontiger* (Berlese) have

reduced sternal shield. Little is known about the association between *Myrmozercon* and ants, but instability in character states within the genus might suggest that *Myrmozercon* is not simply a commensal in its host's nests and has more intimate relationship such as parasitism or kleptoparasitism, but this has not been studied experimentally.

ACKNOWLEDGEMENTS

We wish to express our appreciation to Dr. Bruce Halliday (CSIRO Entomology, Canberra, Australia) for sending us some important papers for the present work, and to the anonymous reviewers for their valuable comments.

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