A new species of the genus Gaeolaelaps (Acari, Mesostigmata, Laelapidae) from Iran

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Abstract
The Genus Gaeolaelaps Evans & Till, 1966 is currently one of the largest genera of the family Laelapidae Berlese. The known representatives of this genus are active predators of small invertebrates such as other mites, insect eggs and nematodes. Gaeolaelaps iranicus Kavianpour & Nemati sp. n., was collected from soil and litter in various parts of Iran. The description and figures of this species are given. A key to the Gaeolaelaps species of Iran is provided.

Keywords
Taxonomy, Acari, Mesostigmata, Laelapidae, Gaeolaelaps
Introduction

The mite family Laelapidae Berlese includes hundreds of species that are free-living predators in soil, as well as many others that have varying degrees of association with other animals, both vertebrates and invertebrates (Faraji and Halliday 2009). The genus *Gaeolaelaps* Evans & Till is currently one of the largest genera of the family Laelapidae. Some species of this genus, such as *Gaeolaelaps aculeifer* Canestrini, *G. oreithyiae* Walter and Oliver, and *G. gillespiei* Beaulieu, are aggressive predators of nematodes and immature arthropods (Beaulieu 2009, Smiley et al. 2003, Trach 2012, Walter and Moser 2010).

*Gaeolaelaps* was considered at different taxonomic levels by authors: as a species group (Van Aswegen and Loots 1970); as a subgenus of *Hypoaspis* sens. lat. (Karg 1962, 1982, 1989, 1987, Faraji et al. 2008), and as a distinct genus (Lapina 1976, Ryke 1963, Hyatt 1964, Rosario 1981, Walter and Oliver 1989). We herein consider *Gaeolaelaps* as a genus. So far, a total of twelve species were reported from Iran: *G. aculeifer* (Canestrini), *G. nolli* (Karg), *G. kargi* (Costa), *G. queenslandicus* (Womersley), *G. angusta* (Karg), *G. angustiscutatus* (Willmann), *G. praesternalis* (Willmann), *G. minor* (Costa), *G. postreticularis* (Xu & Liang), *G. deinos* (Zeman), *G. oreithyiae* (Walter & Oliver), and *G. glabrosimilis* (Hirschmann, Bernhard, Greim & Götz) (Mosaddegh 1997, Nemati et al. 2000, Kamali et al. 2001, Hadad Irani-Nejad et al. 2003, Mosavi et al. 2004, Noei 2007, Faraji et al. 2008, Babaeian et al. 2010, Nemati and Babaeian 2010, Ramezani and Nemati 2010). During our survey of soil and litter habitats in Iran we discovered a thirteenth species, new to science, which we describe in this paper.

Materials and methods

Mites were collected from various soil and litter samples from different parts of Esfahan, Chaharmahal Va Bakhtiari and Khuzestan provinces in Iran. Mites were extracted from samples using Berlese funnels, placed in lactic acid at 55 °C for clearing and then mounted in Hoyer’s medium on permanent microslides. All specimens were examined under a phase contrast microscope. Line drawings were made by use of a drawing tube and figures were performed with Corel X-draw software, based on the scanned line drawings. Seven specimens were used for most characters measurements. All the measurements are given in micrometers (μm). The dorsal setae notation followed that of Lindquist and Evans (1965). The term lyrifissures and pore are used to refer to slit-shaped and circular or oval-shaped cuticular openings, respectively. We have attempted to identify all pore-like structures, but we acknowledge that some may have been overlooked. The holotype and some of the paratypes are deposited in the Acarological Laboratory, Department of Plant Protection, Agricultural College, Shahrekord University Shahrekord, Iran. Some paratypes are deposited in the Senckenberg Museum fur Naturkunde Gorlitz Am Museum 1 02826 Gorlitz Germany and Acarological Laboratory, Department of Plant Protection, Agricultural College, Shahid-Chamran University, Ahwaz, Iran.
A new species of the genus Gaeolaelaps (Acari, Mesostigmata, Laelapidae) from Iran

Results

Genus Gaeolaelaps Evans & Till, 1966

Type species: Laelaps aculeifer Canestrini (1884), by original designation (Evans and Till 1966).

Gaeolaelaps iranicus Kavianpour & Nemati, sp. n.
urn:lsid:zoobank.org:act:2E62A4A8-00F3-4F54-BA82-E10A85DDBCF3
http://species-id.net/wiki/Gaeolaelaps_iranicus
Figures 1–8

Specimens examined. Holotype, female, soil, Shahreza (32°03'N, 51°54'E, alt. 1777 m), Esfahan Province, Iran, 11 July 2010; coll., M. Kavianpour.
Paratypes: Females, soil from different parts of Shahreza, Esfahan province, and from different parts of Chaharmahal Va Bakhtiari and Khuzestan provinces, Iran, with the following data: Esfahan province, Shahreza: eight females (32°07'N, 51°55'E, alt. 1725 m), 22 August 2010; one female (32°06'N, 51°54'E, alt. 1747 m), 22 August 2010; three females (32°02'N, 51°53'E, alt. 1795 m), 1 September 2010; one female (32°01'N, 51°53'E, alt. 1799 m), 5 September 2010; seven females (32°01'N, 51°53'E, alt. 1800 m), 20 March 2011; five females (32°01'N, 51°53'E, alt. 1806 m), 4 April 2011; three females (32°02’N, 51°51’E, alt. 1827 m), 17 July 2011; one female (31°56'N, 51°44'E, alt. 1963 m), 4 August 2011.
Chaharmahal Va Bakhtiari province, Shahrekord (32°19’N, 50°51’E, alt. 2206 m), three females, soil and litter, 2012, coll., A. Nemati.
Khuzestan province, Baghmalek (31°31’N, 49°53’E, alt. 707 m), two females, soil; Ghaletol (31°37’N, 49°53’E, alt. 885 m), two females, soil; Izeh (31°49’N, 49°52’E, alt. 845 m), two females, soil, 2012, coll., A. Nemati.

Diagnosis. Female; with small size (330–400); dorsal shield with 36 pairs of setae (PX2 and S1 missing), PX3 setae present between J and Z series, only two pairs of marginal setae (r6, R5) in soft lateral cuticle, considerably shorter than dorsal shield setae; peritremes long, extending to anterior of setae s1; leg IV: tarsus (91-99: basitarsus + telotarsus), (al1-3, av1-2, pl1-3 and pv1-2 thickened, ad2-3 and pd2-3 slender and very elongate: ad2-3 (0.55–0.57 and 0.66-0.69 × the length of tarsus IV respectively) and pd2-3 (0.74–0.83 and 0.94-1.02 × the length of tarsus IV respectively).

Description of the female (n = 7). Figures 1–8.

Dorsal idiosoma. Fig 1. Dorsal shield oval-shaped, 330-400 long, width at level of setae r3 170-195; reticulation more distinct posterior to setae j6; shield with 36 pairs of thin and simple setae, 21 pairs on podonotal region (j1-6; z1, z2, z4-6; s1-6; r2-5; z3 missing) and 15 pairs on opisthonotal region (J1-5, Z1-5, S2-5), including PX3 between J and Z series; PX2 and S1 missing. Dorsal setae vary in length, with
opisthonotal setae generally slightly longer than podonotal setae: \( j1 \) (14-20), \( j2 \) (16-21), \( j3 \) (20-33), \( j4 \) (21-34), \( j5 \) (20-28), \( j6 \) (22-34); \( z1 \) (8-14), \( z2 \), \( z4 \), \( z5 \), \( z6 \) (22-34); \( s1 \) (13-16), \( s2 \) (15-26), \( s3 \) (26-38), \( s4-6 \) (27-36); \( r2 \), \( r3 \), \( r4 \) and \( r5 \) (21-31); \( J1 \), \( J2 \) (21-28), \( J3 \) (18-28), \( J4 \) (25-34), \( J5 \) (29-39); \( Z1 \) (25-34), \( Z2-Z3 \) (18-30), \( Z4 \) (26-39), \( Z5 \) longest (40-50), \( S2-S4 \) (14-20), \( S5 \) (18-25). Cuticle between dorsal and ventral side of body bearing \( r6 \) (between \( s6 \) and \( Z1 \)) and \( R5 \) (between \( S4-S5 \)), length 8 and 12 μm long, respectively. Podonotal and opisthonotal regions with 9 and 10 pairs of lyrifissures and pore-like structures, respectively, as shown in Fig. 1.

**Ventral idiosoma** (Fig 2). Tritosternum with tubular base (23-26) and pilose laciniae (70-75). Pre-sternal area granulated, with a pair of distinct, although poorly sclerotized plates. Sternal shield with smooth surface, 111-114 long, 114-118 wide (at level of projection between coxae II-III), with very small notch anteromedially; posterior margin irregular, almost straight. Sternal setae smooth, \( st1 \), \( st2 \) and \( st3 \) (26-29),
A new species of the genus Gaeolaelaps (Acari, Mesostigmata, Laelapidae) from Iran

iv1 slit-like, located slightly behind st1; iv2 pore-like, between st2-st3. Setae st4 (23-26) and pore-like iv3 located on integument. Tongue-shaped genital shield 127-135 long (including hyaline flap at base of posterior margin of sternal shield), 57-60 wide, bearing 1 pair of setae (st5 = 21-28) and a pattern of inverted v-shaped lines; paragenital pores (iv5) on soft integument near genital setae. Anal shield pyriform, reticulated, 65-70 long, 62-67 wide, post-anal seta (34-42) longer than paranal setae (18-22). Cribrum like a strip of teeth, extending laterally to level of post-anal seta. Opisthogastric surface with: 1 pair of suboval metapodal plates (12-15 × 3-6); 2 pairs of minute platelets (between metapodal plate and paragenital platelet); 1 pair of narrow, elongate paragenital platelets; 9 pairs of smooth setae, ZV1-4 and JV1-5 16-29 long; and 7 pairs of pore-like structures, plus 1 pair on lateral margin of anal shield.

Stigma surrounded by short, narrow, pointed stigmatal plate, which extends posteriorly past level of mid-coxae IV (a distance ca. thrice diameter of stigma). Peritremes long, extending to anterior of setae s1. Narrow endopodal platelet present mesad coxae III–IV. Narrow exopodal plate surrounding coxae IV, and small exopodal plate between coxae II–III.

Gnathosoma. Hypostome (Fig. 3) with 3 pairs of similar smooth simple setae; h1, h3 (20-26), h2 (15-17). Palpcoxal setae 15-18 long. Deutosternal groove with 6 rows of 8-10 denticles; corniculi normal, horn-like. Epistome rounded with fine denticulations at anterior margin (Fig. 4). Chelicerae (Fig. 5) normal for genus, arthrodial processes developed, moveable digit (40-45) with 2 teeth, middle article (105-120), fixed digit with 4 teeth + offset tooth (gabelzahn), setaceous pilus dentilis small. Palp chaetotaxy normal (sensu Evans and Till 1965), with simple setae except al on femur thickened, spine-like, al1 and al2 of genu thickened, al1 with tip rounded and al2 spine-like; palp apotele two-tined (Fig. 6).

Figures 3–6. Gaeolaelaps iranicus Kavianpour & Nemati sp. n., Female. 3 Hypostome 4 Epistome 5 Chelicera 6 Apotele.
Legs. Tarsi I–IV with claws and ambulacra. Legs I (432–442) and IV (382–397), longer than legs II (283–291) and III (255–270). Chaetotaxy of all leg segments normal for *Gaeolaelaps* (sensu Beaulieu 2009). Chaetotaxy of legs II and IV as shown in figures 7 and 8, respectively. Setae on legs I and III simple, slender; some setae on legs II and IV thickened or elongate, as follows. Leg II: femur (al2 and av2 short, slightly thickened, pd1 elongate, slender), genu (setae av1 and pv1 slightly thickened), tibia (av1 and pv1 slightly thickened), tarsus (all setae thickened, except al2-3, pl2-3, ad3 and pd3). Leg IV: trochanter (seta pv2 thickened), femur (seta pd thickened, ad1 elongate, slightly thickened), tibia (setae al1, av1 and pv1 thickened), tarsus (al1-3, av1-2, pl1-3 and pv1-2 thickened, ad2-3 and pd2-3 very elongate).

**Insemination structures.** Not seen.

**Male.** Unknown.

**Etymology.** The name of this new species refers to the currently known geographic range of the mite.

**Notes.** *Gaeolaelaps iranicus* sp. n. is differentiated by the following combination of characters: small size (330–400 long), the presence of four very long setae on tarsus IV (ad2, ad3, pd2 and pd3), and 36 pairs of dorsal setae, with the absence of PX2 and S1 on the opisthonal part of the dorsal shield, and the presence of two pairs of r-setae (r6, R5) on soft cuticle, which are considerably shorter than the dorsal shield setae.

The dorsal shield chaetotaxy is not always properly described, especially in older descriptions. However, species with as few as 36 pairs of setae appear to be rare, but some species do lack one pair of PX setae, as found in *G. iranicus*. Some specimens of
A new species of the genus Gaeolaelaps (Acari, Mesostigmata, Laelapidae) from Iran

G. fishtowni (Ruf and Koehler 1993) appear to lack seta PX3 but this species is larger than G. iranicus (565-653), has thickened spine or spur-like setae on the femur, genu, tibia and tarsus of leg II and tarsus IV, and the dorsal shield is posteriorly attenuated.

G. vanpletzeni (Van Aswegen and Loots 1970) has 38 pairs of setae on dorsal shield, lacking the R series, and has only one pair of PX setae (PX2), while G. iranicus sp. n. has 36 pairs of dorsal setae, with R5 and PX3 present. G. spiniseta (Barilo 1991) has 38 pairs of dorsal setae, with one pair of PX setae (PX2), a larger size (505–525), and with elongate spine-like setae on tarsus IV.

Gaeolaelaps kargi (Costa) has two elongate setae on tarsus IV, S1 and PX2-3 present, the postanal seta as long as the para-anal setae, and lacks elongate setae on genu IV. In contrast, G. iranicus sp. n. has four elongate setae on tarsus IV, lacks S1 and PX2, the post-anal seta is considerably longer than the para-anal setae, and has two elongate setae (ad1 and pd1) on genu IV.

Gaeolaelaps nolli (Karg) has two elongate setae on tarsus IV, a short peritreme (extending to the middle part of coxae II) and has z3, PX2 and S2, while G. iranicus sp. n. has four elongate setae on tarsus IV, a longer peritreme and lacks z3, PX2 and S2.

Some characters of G. iranicus sp. n. seem to be unique, but again poor descriptions hinder comparisons from the literature. For example, the presence of elongate setae on the femur, genu and tibia of leg IV (ad1 on femur, ad1 and pd1 on genu, ad2-3 and pd2-3 on tarsus) is likely, in combination, to be unique in Gaeolaelaps. The length of leg segments and the relative lengths of the setae and their form may also be of taxonomic value. Hence we also report the following data relating to these characters: femur IV (80-82), ad1 (0.77–0.87 × the length of femur); genu IV (55-57), ad1 (0.77-0.91 × the length of genu), pd1 (0.77-0.86 × the length of genu); tarsus IV (91-99; basitarsus + telotarsus), (al1-3, av1-2, pl1-3 and pv1-2 thickened, ad2-3 and pd2-3 slender and very elongate: ad2-3 (0.55-0.57 and 0.66-0.69 × the length of tarsus IV respectively) and pd2-3 (0.74-0.83 and 0.94-1.02 × the length of tarsus IV respectively).

Key to the Gaeolaelaps of Iran (females)

1 Peritreme short, reaches to middle level of coxa II ........................................
   – Peritreme longer, reaches at least to anterior level of coxa I .......................... 2
2 Dorsal shield attenuated, with sudden constriction caudally ...................... 3
   – Dorsal shield normal or less attenuated posteriorly ................................. 5
3 Leg II with thickened spines, especially a thick spine on femur II; moveable digit of chelicerae with 2 teeth; palp tarsal claw 3-tined ........................................ 4
   – Without thickened spines on leg II and femur II; movable digit of chelicerae with 2 larger and several smaller teeth; palp tarsal claw 2-tined .........................
      ........................................................ G. angustiscutatus (Willmann, 1951)
4 Leg I shorter than idiosoma; epistome with a row of equal denticles; dorsal shield without a curvature.................................................. G. angusta (Karg, 1965)
Leg I longer than idiosoma; epistome with 2 teeth longer than the others; dorsal shield with a curvature in posterior part

G. queenslandicus (Womersley, 1956)

Tarsus of leg IV with spine-like setae thicker than normal

G. aculeifer (Canestrini, 1883)

Some podonotal setae elongate, twice the length of opisthonotal setae, fixed digit of chelicerae with 12-14 teeth

G. oreithyiae (Walter & Oliver, 1989)

Seta s1 located in presternal region off sternal shield

G. minor (Costa, 1968)

Genital shield with diagonal parallel lines that meet together in the median area of the shield; sternal shield with concave posterior margin; with 3 unpaired setae between J series; seta z3 present

G. glabrosimilis (Hirschmann, Bernhard, Greim & Gotz, 1969)

Dorsal shield setae short, none of them reach to base of next setae; without elongate setae on tarsus IV

G. praesternalis (Willmann, 1949) after Karg (1971)**

With setae PX2-3 and S1; with 2 elongate setae on tarsus IV, para-anal setae slightly shorter than or as long as post-anal seta

G. kargi (Costa, 1968)

Without setae PX2 and S1; with 4 elongate setae on tarsus IV, post-anal seta considerably longer than para-anal setae

G. iranicus sp. n.

* We suspect G. postreticulatus (Xu & Liang) recorded by Montazeri et al. (2011) from Iran is a junior synonym of G. nolli.

** The second author has examined the following materials: Two females, soil, Izeh, Khuzestan province, Iran, 2010.

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References

Babaieian E, Seraj AA, Nemati A, Kazemi S (2010) Mites of the family Laelapidae (Acari: Mesostigmata) in Shahreked region. Nineteenth Plant Protection Congress, Tehran, Iran. Abstract book, Volume 1, 328.

Barilo AB (1991) New species of the soil laelapid mites (Parasitiformes, Laelapidae) from Middle Asia. Vestnik Zoologii 25(1): 13–17. [In Russian]

Beaulieu F (2009) Review of the mite genus Gaeolaelaps Evans and Till (Acari: Laelapidae) and description of a new species from North America, G. gillespiei n. sp. Zootaxa 2158: 33–49.

Canestrini G (1884) Acari nuovi o poco noti. Atti del Reale Istituto Veneto di Scienze, Lettere ed Arti (Series 6) 2: 693–724.

Costa M (1968) Little known and new litter-inhabiting laelapine mites (Acari: Mesostigmata) from Israel. Israel Journal of Zoology 17: 1–30.

Evans GO, Till WM (1966) Studies on the British Dermanyssidae (Acari: Mesostigmata). Part II. Classification. Bulletin of the British Museum (Natural History) Zoology 14: 107–370.

Faraji F, Abedi L, Ostovan H (2008) A new species of Hypoaspis Canestrini from Iran with a key to the Iranian species of Hypoaspis (Acari, Gamasina, Hypoaspisidae), Zoosystematics and Evolution, 84(2): 205–209. doi: 10.1002/zoos.200800005

Faraji F, Halliday B (2009) Five new species of mites (Acari: Laelapidae) associated with large Australian cockroaches (Blattodea: Blaberidae). International Journal of Acarology 35(3): 245–264. doi: 10.1080/01602230802059445

Gerson U, Smiley RL, Ochoa R (2003) Mites (Acarina) for Pest Control. Blackwell Science Ltd, Iowa, 539 p. doi: 10.1002/9780470750995

Hadam Irani-Nejad K, Hajiganbar HR, Talebi Chaichi P (2003) Introduction of some mesostigmatid mites of sugar beet fields in Miandoab plain. Journal of Agricultural Sciences and Natural Resources 10(2): 147–157.

Hirschmann W, Bernhard F, Greim E, Götz H (1969) Gangsystematik der Parasitiformes, Teile 75. Zwanzig neue Hypoaspis–Arten. Acarologie. Schriftenreihe für Vergleichende Milbenkunde 12: 133–141.

Hunter PE, Yeh SH (1969) Hypoaspis (Geolaelaps) disjuncta n. sp. (Acarina: Laelapidae) associated with the horned passalus beetles. Journal of Georgia Entomological Society 4(3): 97–102.

Hyatt KH (1964) A collection of Mesostigma (Acarina) associated with Coleoptera and Hemiptera in Venezuela. Bulletin of the British Museum (Natural History) Zoology 11: 465–509.

Kamali K, Ostovan H, Atamehr A (2001) A catalog of mites and ticks (Acari) of Iran. Islamic Azad University Scientific Publication Center, Tehran, 196 pp.

Karg W (1962) Zur Systematik und Postembryonalen Entwicklung der Gamasiden (Acarina, Parasitiformes) landwirtschaftlich genutzter Boden. Mitteilungen aus dem Zoologischen Museum in Berlin 38: 23–119.

Karg W (1965) Larvalsystematische und phylogenetische Untersuchung sowie Revision des Systems der Gamasina Leach, 1915 (Acarina, Parasitiformes). Mitteilungen aus dem Zoologischen Museum in Berlin 41: 193–340. doi: 10.1002/mmnz.19650410207

Karg W (1982) Zur Kenntnis der Raubmilbeng Hypoaspis Canestrini 1884 (Acarina, Parasitiformes). Mitteilungen aus dem Zoologischen Museum in Berlin 58: 233–256.
Karg W (1987) Neue Raubmilbenarten der Gattung *Hypoaspis* Canestrini 1884 (Acarina, Parasitiformes). Zoologische Jahrbücher Abteilung für Systematik Okologie und Geographie der Tiere 114: 289–302.

Karg W (1989) Zur Kenntnis der Untergattungen *Geolaelaps*, *Alloparasitus* und *Laelaspis* der Raubmilbengattung *Hypoaspis* Canestrini 1884 (Acarina, Parasitiformes). Mitteilungen aus dem Zoologischen Museum in Berlin 65: 115–126. doi: 10.1002/mmnz.19890650103

Lapina IM (1976) Free-living gamasoid mites of the family Laelaptidae Berlese 1892 in the fauna of Latvian SSR. Latvijas Entomologs 19: 20–64. [in Russian]

Lindquist EE, Evans GO (1965) Taxonomic concepts in the Ascidae, with a modified setal nomenclature for the idiosoma of the Gamasina (Acarina: Mesostigmata). Memoirs of the Entomological Society of Canada 47: 1–64. doi: 10.4039/entm9747fv

Montazeri N, Nemati A, Ostovan H, Gwiazdowicz D (2011) Fauna of some mesostigmatic mites (Acarina:Mesostigmata) in Shiraz, Iran. In: Proceeding book of the First Persian Congress of Acarology, Iran, Kerman, 44 pp.

Mosaddegh MS (1997) Some mites of the honeybee *Apis mellifera* L. hives in Iran. The Scientific Journal of Agriculture, Shahid Chamran University, Ahwaz, Iran 19(1/2): 7–16.

Mosavi SH, Ostovan H, Adldooost H (2004) Study of the mite fauna of potato fields in Orumieh. Sixteenth Iranian Plant Protection Congress, Tabriz, Iran. Abstract book, 263.

Nemati A, Babaeian E (2010) Mites associated with insects in Chaharmahal-Bakhtiari, Khuzestan and Bushehr provinces. Nineteenth Iranian Plant Protection Congress, Tehran (Iran), August 2010. Iranian Research Institute of Plant Protection. Abstract book, Volume 1, 364.

Nemati A, Kamali K, Mosaddegh MS (2000) A faunistic survey of Laelapidae (Acarina: Mesostigmata) mites in the soil of Ahwaz region, Khuzestan province. In: Abstract book. Fourteenth Iranian Plant Protection Congress. Esfahan, Iran, Volume 1, 333.

Noei J (2007) Identification of rice storage mites in Guilan Province under different storage conditions. MSc Thesis in Persian with English summary, University of Guilan, Rasht, Iran.

Ramezani Z, Nemati A (2010) Records of two new genera of Parholaspididae Krantz and Laelapidae Berlese (Acarina: Mesostigmata) from Iran. Nineteenth Plant Protection Congress, Tehran, Iran. Abstract book, Volume 1, 351.

Rosario RMT (1981) Philippine Hypoaspidinae (Acarina: Mesostigmata: Laelapidae). Philippine Entomologist 5: 23–82.

Ruf A, Koehler H (1993) *Hypoaspis fishtowni* sp. nov. (Acarina, Mesostigmata, Laelapidae): a new predatory mite. Acarologia 34: 193–198.

Ryke PAJ (1963) Some free-living Hypoaspidinae (Acarina: Mesostigmata) from South Africa. Revista de Biología 5: 1–15.

Strandtmann RW (1963) Some previously unpublished drawings of gamasid mites by the late Dr. A. C. Oudemans. Journal of the Kansas Entomological Society 36: 2–31.

Strong K, Halliday B (1994) Three New Species of *Hypoaspis* Canestrini (Acarina: Laelapidae) Associated with Large Australian Cockroaches. Journal of Australian Entomological Society 33: 87–96. doi: 10.1111/j.1440-6055.1994.tb00927.x

Trach VA (2012) *Gaeolaelaps carabidophilus* n. sp., a new mite species (Acarina: Mesostigmata: Laelapidae) from carabid beetles (Coleoptera: Carabidae) from Southern Ukraine. Acarologia 52(2): 157–163. doi: 10.1051/acarologia/20122045
A new species of the genus Gaeolaelaps (Acari, Mesostigmata, Laelapidae) from Iran

Van Aswegen PIM, Loots GC (1970) A taxonomic study of the genus Hypoaspis Canestrini sens. lat. (Acari: Laelapinae) in the Ethiopian region. Publicações Culturais da Companhia de Diamantes de Angola 82: 167–213.

Walter D, Moser J (2010) *Gaeolaelaps invictianus*, a new and unusual species of Hypoaspidine mite (Acari: Mesostigmata: Laelapidae) phoretic on the Red imported fire ant *Solenopsis invicta* Buren (Hymenoptera: Formicidae) in Louisiana, USA. International Journal of Acarology 36 (5): 399 - 407. doi: 10.1080/01647954.2010.481263

Walter DE, Oliver JH (1989) *Geolaelaps oreithyiae*, n. sp. (Acari: Laelapidae), a thelytokous predator of arthropods and nematodes, and a discussion of clonal reproduction in the Mesostigmata. Acarologia 30: 293–303.

Willmann C (1949) Beiträge zur Kenntnis des Salzgebietes von Ciechocinek. 1. Milben aus den Salzwiesen und Salzmooren von Ciechocinek an der Weichsel. Veröffentlichungen aus dem Museum für Natur-, Völker- und Handelskunde in Bremen, Reihe A 1: 106–142.

Willmann C (1951) Untersuchungen über die terrestrische Milbenfauna im pannonischen Klimagebiet Österreichs. Sitzungs Öst Akad Wissensch Math-Naturwiss Abteilung I. 160: 91–176.

Womersley H (1956) On some new Acarina-Mesostigmata from Australia, New Zealand and New Guinea. Journal of the Linnean Society of London (Zoology) 42: 505–599.

Zeman P (1982) Two new species of Hypoaspidinae (Acari: Mesostigmata: Dermanyssidae) associated with ants. Vestnik Ceskoslovenske Spolecnosti Zooligicke 46: 231–237.