

A NEW SPECIES OF *GAEOLAELOPS* EVANS AND TILL (ACARI: LAELAPIDAE) ON *ACINOPUS* SP. (COLEOPTERA: CARABIDAE) FROM IRAN

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ABSTRACT — A new mite species of the genus *Gaeolaelaps*, *Gaeolaelaps saboorii* n. sp., collected from under the elytra and on the abdomen of *Acinopus* sp. (Coleoptera: Carabidae) in Iran, is described and illustrated.

KEYWORDS — Acari; Laelapidae; phoretic mite; beetle; *Gaeolaelaps*; Iran

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). Most *Gaeolaelaps* species were reported from soil-litter habitats, some others were collected from nests of vertebrates, from arthropods (or their nests), including mygalomorph spiders, millipedes, cockroaches, termites, mole crickets, cerambycid, passalid, carabid beetles and ants (Bregetova, 1977; Rosario, 1981; Tenorio, 1982; Karg, 1993; Strong and Halliday, 1994; Fain *et al.*, 1995; Beaulieu, 2009). A large numbers of *Gaeolaelaps* species have been described in a loosely-defined genus *Hypoaspis sens. lat.*

Gaeolaelaps was considered at different taxonomic levels by some authors but we herein consider it as a separate genus (Beaulieu, 2009).

In Iran, only *Gaeolaelaps nolli* (Karg, 1962) was

previously encountered on ground beetles (Nemati and Babaeian, 2010). It is probably that this record is accidental because *G. nolli* is typically known from soil and litter (Karg, 1962).

A large proportion of species identified or described as *Hypoaspis* appear to belong to *Gaeolaelaps* Evans and Till, 1966, as currently defined in previous publication (Karg, 1979; Tenorio, 1982; Beaulieu, 2009).

In the present work, one new species of *Gaeolaelaps* is described based on adult female and male taken from *Acinopus* sp. of the family Carabidae from northern Iran.

MATERIALS AND METHODS

Laelapidae phoretic on beetles were collected mainly in some regions of northern Iran over a period of two years. Beetles of the family Carabidae were collected using light traps, and then placed individually in vials of 70 % ethanol. Mites

were removed from the beetles, cleared in Nesbitt's solution and mounted in Hoyer's medium. The nomenclature used for the dorsal idiosomal chaetotaxy is that of Lindquist and Evans (1965), the leg chaetotaxy is that of Evans (1963a), the palp chaetotaxy is that of Evans (1963b), and names of other anatomical structures mostly follow Evans and Till (1979). We use the term "lyrifissures" to refer to slit-shaped sensilli (not true pores), and "pore" for circular or oval-shaped cuticular openings of unspecified function. Holotype and male paratype of the new species are deposited in the Acarological Collection, Department of Plant Protection, Yazd Branch, Islamic Azad University (YIAU). Two paratypes are also deposited in the Jalal Afshar Zoological Museum, College of Agriculture, University of Tehran, Iran (JAZM) and in the Australian National Insect Collection, CSIRO Ecosystem Sciences, Canberra, Australia (ANIC). All measurements in the descriptions are given in micrometres (μm).

Genus *Gaeolaelaps* Evans and Till

Geolaelaps Berlese, 1923: 254, *nomen nudum* (see Halliday and Lindquist, 2007)

Gaeolaelaps Trägårdh, 1952: 66, *nomen nudum*.

Gaeolaelaps Evans and Till, 1966: 159, correct original spelling as clarified by Halliday and Lindquist (2007).

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

Diagnosis — The concept of *Gaeolaelaps* used here is based on that of Beaulieu (2009).

Gaeolaelaps saboorii n. sp. (Figures 1 and 2)

Type material — Holotype, female, Polur, Mazandaran Province, Iran, 35°50' N, 52°17' E, alt. 2422 m, 10 July 2013, O. Joharchi and E. Babaeian coll., on *Acinopus* sp. (in JAZM). Paratypes: two females, one male, same data as holotype (in YIAU, JAZM and ANIC).

Diagnosis — Dorsal shield oval, with 39 pairs of setae, podonotal setae slightly longer than opisthonotal setae, with one or two unpaired postero-median seta, epistome triangular (projecting medially) and almost smooth with a few denti-

cles, fixed digit with four teeth and movable digit bidentate.

Description of the Female (Figures 1, 2A and 2B)

Dorsal idiosoma — Dorsal shield oval shaped, 610 – 618 long, 394 – 396 wide at level of $r3$ ($n = 3$), margin with a narrow strip of unsclerotised integument by posteriorly rounded, not covering most of the idiosoma, leaving a curved strip of unprotected skin (30 – 34) posterior to setae $Z5$; shield with reticulate pattern on the whole surface except anteromedial region (Figure 1A). Shield with 39 pairs of setae, 22 pairs of podonotal setae on shield, plus $r6$ on lateral soft cuticle, and 17 pairs of opisthonotal setae on shield, including two pairs of Zx setae between J and Z setae; all setae smooth and moderate in length (Figure 1B), podonotal setae slightly longer than opisthonotal setae, $j1$, $z1$ (25 – 27), $j2$ (37 – 40), $j3-5$, $z4$, $s3-5$ (62 – 64), $j6$, $z5$ (50 – 52), $J1-4$ (45 – 52), $J5$ (37 – 39), $S2$, $S4$ (60 – 62), $Z5$, $Z4$, Zx (50 – 54). Opisthonotal region also with one or two unpaired supernumerary seta Jx (48 – 50) in each specimen. Shield with 16 pairs of pore-like structures, apparently including three pairs of gland pores (labelled g in Figure 1A) and 13 pairs of poroids; lyrifissures near the base of $j1$ large and slit-like, others smaller and ovoid to circular. Seven pairs setae in R series on the lateral soft skin which surrounding shield.

Ventral idiosoma — (Figure 1C). Tritosternum with paired pilose laciniae (74 – 77), columnar base 27 – 29 $\times$ 17 – 18 wide; presternal area with transverse lightly sclerotised presternal lines. Sternal shield (length 124 – 128) narrowest between coxae II (114 – 118), widest between coxa II-III (174 – 188), with straight anterior margin and posterior margin with a strong semicircular dent, bears three pairs of smooth pointed setae ($st1$ 45 – 52, $st2$ 47 – 50, $st3$ 47 – 52), never reaching to base of next posterior seta, and two pairs of lyrifissures, one pair adjacent to setae $st1$, the other between $st2$ and $st3$, anterolateral surface of sternal shield with polygonal ornamentation and posteromedian region smooth. Metasternal platelets absent, metasternal setae $st4$ (42 – 45) and metasternal pores located on soft integument. Endopodal plates II/III completely fused to sternal shield, endopodal plates III/IV elongate, narrow, curved. Genital shield tongue-shaped, slightly

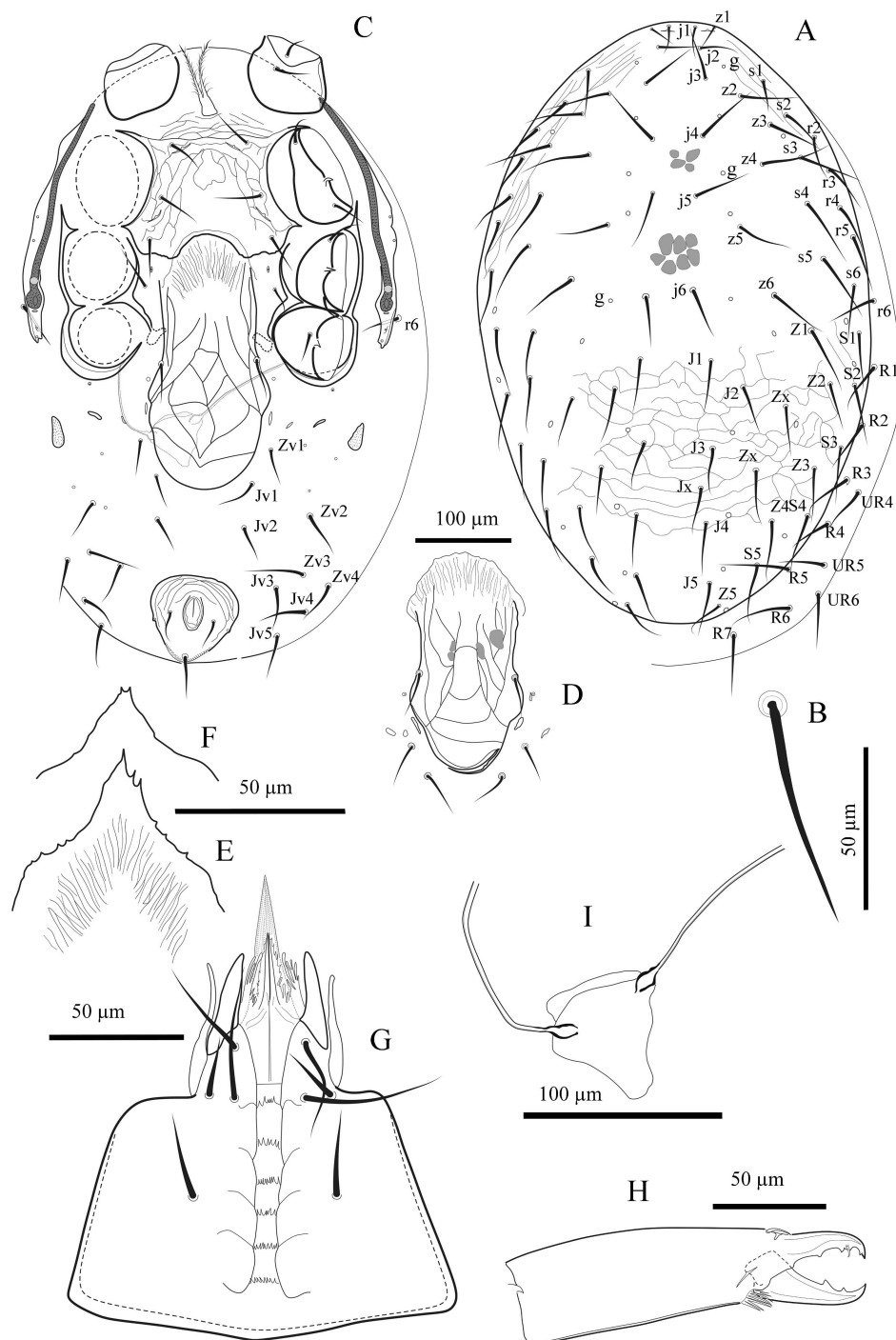


FIGURE 1: *Gaeolaelaps saboorii* n. sp., female: A - Dorsal shield; B - Detail of a dorsal seta; C - Ventral idiosoma; D - Variety of shape of genital shield; E - Epistome; F - Variety of shape of epistome; G - Hypostome; H - Chelicera; I - Insemination structures.

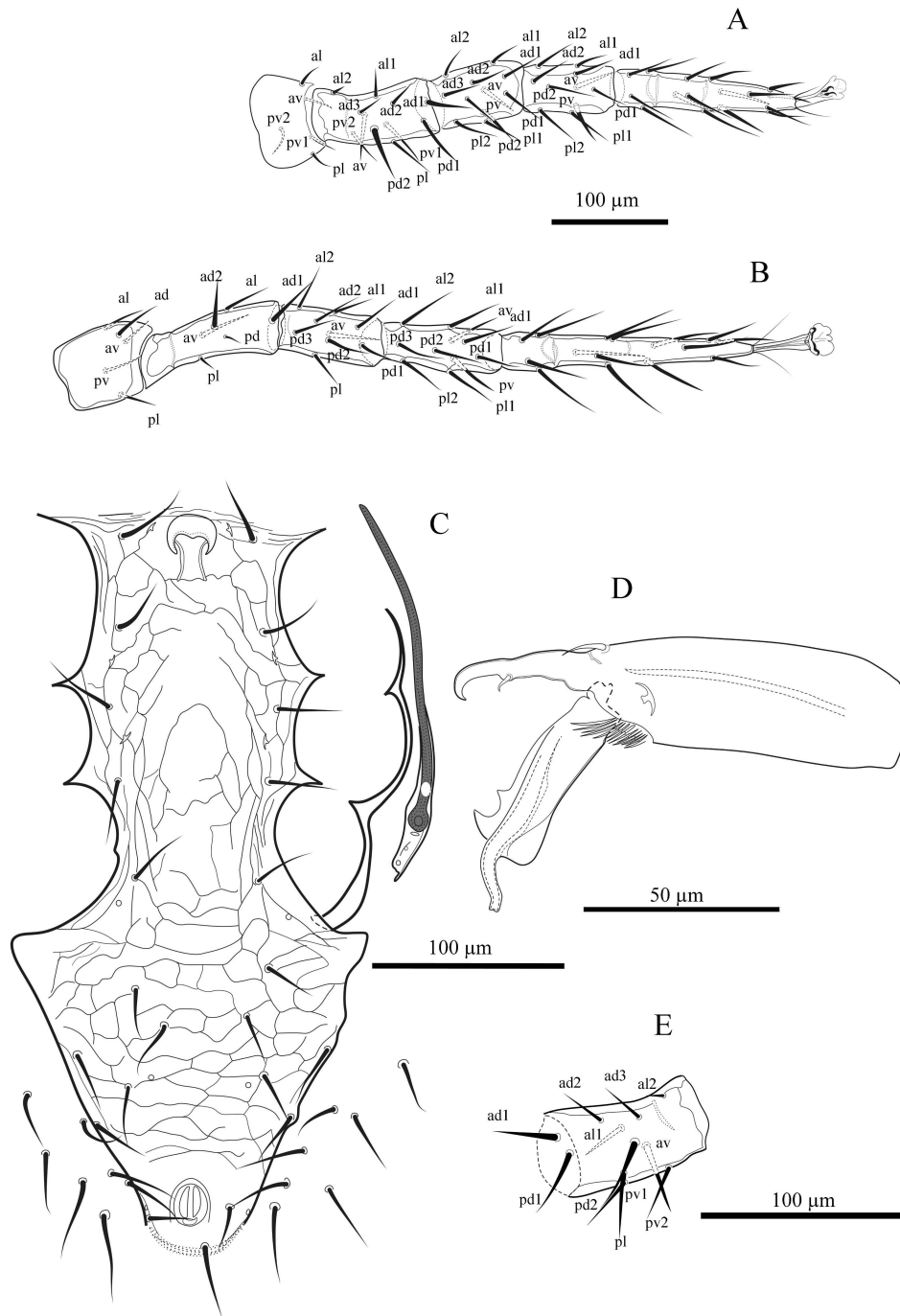


FIGURE 2: *Gaeolaelaps saboorii* n. sp., female: A - Leg II, dorsal aspect; B - Leg IV, dorsal aspect; male: C - Ventral shield; D - Chelicera; E - Femur II, dorsal aspect.

protruding laterally at the level posterior to setae *st5*, length 222 – 252, maximum width 114 – 118, posterior margin rounded or slightly pointed (Figures 1C – D), surface reticulate, with several weak transverse and longitudinal markings and a pair of simple setae *st5*. Shield flanked by a pair of minute narrow platelets; paragenital pores located on soft cuticle lateral to shield between seta *st5* and minute narrow platelet. Anal shield rounded anteriorly and triangular posteriorly, length 92 – 94, width 87 – 89, anterior half with lineate ornamentation, para-anal setae (27) shorter than unpaired post-anal seta (37 – 40), cribrum small, anal pores flank anal shield. Opisthogaster with one pair of sub-triangular metapodal plates (25 – 27 long $\times$ 10 – 12 wide) and nine pairs of smooth setae (37 – 45). Peritrematal shield free, peritreme extending from coxa IV to near posterior level of coxa I, level with seta *z2* on dorsum, with large protrusion on outer margin and a pair of pores opposite coxae II–III, post-stigmatal section of peritrematal shield conspicuous and narrow, with two pairs of post-stigmatal pores.

Gnathosoma — (Figures 1E – H). Epistome triangular (with a median projection), irregularly denticulate laterally or almost smooth with a few denticles (Figures 1E – F). Hypostomal groove with six transverse rows of denticles, each row with about 6–10 small teeth. Hypostome with four pairs of setae, internal posterior hypostomal setae *h3* longest (50 – 52), *h1* (32 – 35), *h2* (20 – 22), palpcoxal *h4* (30 – 32) (Figure 1G). Corniculi robust and horn-like, reaching mid-level of palp femur. Chaetotaxy of palps: trochanter 2, femur 5, genu 6, tibia 12, tarsus 15, genu with a distinct dorso-distal triangular condyle, all setae smooth and needle-like, palp tarsal apotele two-tined. Fixed digit of chelicera with four teeth: an offset small tooth and two adjoining large teeth at the level of a short, setiform pilus dentilis and a proximal tooth, dorsal seta short, thick and prostrate, movable digit bidentate, arthrodial membrane with a rounded flap and normal filaments (Figure 1H).

Insemination structures — (Figure 1I). Laelapid-type sperm access system, tubulus long, wider at the solenostoma level of coxa III and entering sac-

culus via a pair of circular openings. Sacculus an irregular, the proximal ends of the tubulus slightly swollen at junction with ramus.

Legs — (Figures 2A – B). Legs II and III short (470 – 476, 496 – 500), I and IV longer (618 – 628, 668 – 684) (excluding pretarsus). Chaetotaxy normal for free-living Laelapidae: Leg I: coxa 0-0/1, 0/1-0, trochanter 1-0/2, 1/1-1 (*pl* thick), femur 2-2/1, 3/3-2 (*al1* and dorsal setae thick), genu 2-3/2, 3/1-2 (dorsal setae thick), tibia 2-3/2, 3/1-2 (lateral setae longer). Leg II (Figure 2A): coxa 0-0/1, 0/1-0, trochanter 1-0/1, 0/2-1, femur 2-3/1, 2/2-1 (*al2* tiny thickened, *ad1*, *pd2* thickened, *av*, *pd1*, *pv1* and *pv2* 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). Leg III: coxa 0-0/1, 0/1-0, trochanter 1-0/2, 0/1-1, femur 1-2/1, 1/0-1 (*ad1* and *ad2* thick, ventral seta longer), genu 2-2/1, 2/1-1, tibia: 2-1/1, 2/1-1 (lateral and ventral setae thick). Leg IV (Figure 2B): coxa 0-0/1, 0/0-0, trochanter 1-1/1, 0/1-1 (*ad* slightly thickened), femur 1-2/1, 1/0-1 (*ad1* and *ad2* thickened, *av* slightly thickened), genu 2-2/1, 3/0-1 (*av* slightly thickened), tibia 2-1/1, 3/1-2 (*av* and *pv* slightly thickened). Tarsi I–IV with 18 setae (3- 3/2, 3/2-3 + *mv*, *md*). All pretarsi with well developed paired claws and rounded pulvilli and a long thin stalk.

Description of the Male (Figures 2C, D, E)

Dorsal idiosoma — Dorsal shield 478 long, 314 wide at its broadest point ($n = 1$), ornamentation and chaetotaxy as female.

Ventral idiosoma — (Figure 2C). Sternal, genital, endopodal, ventral and anal shields fused into a holovenral shield, reticulated throughout, bearing *st1*–5, five pairs of opisthogastric setae; four pairs of poroids and a pair of gland pores (*gv3*) laterad of para-anal setae, gland pore (*gv2*) just behind coxa IV obscure; post-anal seta almost twice longer than para-anal setae; cribrum a narrow strip of spicules.

Gnathosoma — Triangular epistome and subcapitular characters similar to female. Fixed digit with one blunt tooth, large distal hook and slender pilus dentilis. Movable digit of chelicera with one large tooth, spermatodactyl longer than movable digit, slightly tapered and with blunt tip, fringed hyaline

arthrodial process at its base (Figure 2D). Palpi with normal setation and similar to those of female.

Legs — Chaetotaxy as female, femur II (*ad1*, *pd1*, *pd2* thickened) as (Figure 2E).

Etymology — This species is named in honour of Prof. Alireza Saboori (Department of Plant Protection, University of Tehran, Iran), who devoted many years to teaching Acarology and training Acarologists in Iran.

Notes — This species is similar to *G. blattae* (Strong and Halliday, 1994) and *G. concavus* (Faraji and Halliday, 2009) in general appearance. The new species can be readily distinguished from them by following characters: peritreme shorter and extending to near the posterior level of coxa I only (longer and extending beyond anterior margin of coxa I in *G. blattae*), fixed digit in the female with four teeth (9-10 in *G. blattae* and 11 in *G. concavus*) and in the male with one blunt tooth large distal hook and slender pilus dentilis (as same as *G. blattae* and *G. concavus*), epistome triangular, projecting medially and almost smooth with a few denticles (rounded and denticulate in *G. blattae* and *G. concavus*), deutosternal groove with 6-10 denticles per row (12-17 in *G. blattae* and 16-20 in *G. concavus*), a smaller genital shield (more extensive and almost reaching anal shield in *G. blattae* and *G. concavus*), spermatodactyle longer, with narrower tip and bending apically as in Figure 2D (spermatodactyle shorter, with expanded tip and curved towards digit in *G. blattae* and *G. concavus*), femur II with *av* and *pv1* slightly thickened (spine-like in *G. blattae* and *G. concavus*).

Remarks — Most *Gaeolaelaps* species described to date were collected from soil-litter habitats, whereas several ones were collected in association with arthropods. Most species that have been placed in *Hypoaspis* actually belong to *Gaeolaelaps* Evans & Till, 1966 (reviewed by Beaulieu, 2009), because they lack long setae on the dorsal shield and on some leg segments (Joharchi and Halliday, 2011).

Gaeolaelaps saboorii n. sp. was collected under elytra and on the abdomen of the *Acinopus* sp.. This species morphologically similar to most other *Gaeolaelaps* species were collected from arthropods (or their nests). It is conceivable that most species associated with arthropods differ from the others in the

genus by having concave posterior margin of sternal shield (deeply or slightly) and having triangular epistome with reduced denticulation and with apical point sometimes. It is possible that these mites are not parasites of beetles at all, but harmless feeders on exudates from the beetles' body (Costa, 1971), or predators that feed on other small invertebrates in the microhabitats created by the beetles (Joharchi and Halliday, 2011).

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