Persian J. Acarol., 2021, Vol. 10, No. 2, pp. 167–189.
https://doi.org/10.22073/pja.v10i2.64420
Journal homepage: http://www.biotaxa.org/pja

http://zoobank.org/urn:lsid:zoobank.org:pub:738A6BAA-9164-479A-9950-775A3EEE4599

Article

A new genus of Laelapidae (Acari: Mesostigmata) from South America

Alireza Nemati[1, 2*], Dariusz J. Gwiazdowicz[3] and Elham Riahi[1]

1. *Plant Protection Department, Agricultural College, Shahrekord University, Shahrekord, Iran; E-mails: nemati.alireza @sku.ac.ir & alireza.nemat@ymail.com, plant.pro2@gmail.com*
2. *Biotechnology Research Institute, Shahrekord University, Shahrekord, Iran.*
3. *Poznan University of Life Sciences, Faculty of Forestry and Wood Technology, Wojska Polskiego 71C, 60–625 Poznań, Poland. E-mail: dariusz.gwiazdowicz@up.poznan.pl*

[*] Corresponding author

ABSTRACT
Hypoaceus **gen. nov.**, a new genus of the family Laelapidae Berlese, is erected and described to accommodate *Hypoaceus eugenitalis* (Karg) **comb. nov.** and *Hypoaceus pycnosis* (Karg) **comb. nov.** that have been collected from Chile and Argentina. Important morphological characters of the above-mentioned species are presented and redescribed based on the type species. Some of the important morphological characters of the new genus are as follows: setae *st4* absent; genitiventral shield well expanded posterior to coxae IV with two-three pairs of setae including *st5* and bears numerous pore-like structures on the surface; interior appendages of internal malae elongate and scarcely barbed; epistome with fair denticles anteriorly; supralabral process long and style like; straight spermadactyl is about of twice of movable digit length; apotele two tined; male holoventral shield bearing numerous pore-like structures on the surface. Tarsus II both in male and female bearing strong spur or spine-like setae (*av1* and *pv1*); male with strong spur-like seta (*pv1*) on femur II.

KEY WORDS: *Alloparasitus*; chaetotaxy; Dermanyssiae; *Hypoaspis*; taxonomy.

PAPER INFO.: Received: 11 September 2020, Accepted: 29 December 2020, Published: 15 April 2021

INTRODUCTION

The family Laelapidae is recognized as the most diverse mesostigmatic family. It includes over 90 genera and more than 1300 species described worldwide. Approximately 35 genera of this family are ectoparasites on their hosts or in their nest. About 10 genera are predators and live in the soil. Also, the species of about 43 genera are arthropod-associated, showing the highest anatomical and ecological diversity (Casanueva 1993; Lindquist *et al.* 2009; Beaulieu 2009). There is disagreement among researchers about the number of subfamilies, genera, and subgenera (Berlese 1903, 1923; Baker and Wharton 1952; Van Aswegen and Loots 1970; Karg 1981; Krantz and Ainscough 1990; Casanueva 1993; Krantz 1998). Lindquist *et al.* (2009) admitted nine subfamilies by considering the phylogenetic study conducting by Casanueva (1993) and the research of Radovsky and Gettinger (1999).The family Laelapidae is not well understood due to its complexity and high species diversity. Hypotheses about the family's evolutionary history and relatives have not been developed, which is why the classification of this family is insufficient (Casanueva 1993). Therefore, to achieve a

How to cite: Nemati, A., Gwiazdowicz, D.J. & Riahi, E. (2021) A new genus of Laelapidae (Acari: Mesostigmata) from South America. *Persian Journal of Acarology*, 10(2): 167–189.

satisfactory stable classification, many attempts were made to define the family and its genera, which resulted in proposing new genera. For example, the genus *Pogonolaelaps* Nemati & Gwiazdowicz, 2016; *Persicolaelaps* Kazemi & Beaulieu, 2016; and *Acantholaelaps* Joharchi *et al.* 2019 were recently proposed and described as a consequence of studying the fauna of unknown areas of Iran and Cuba. During our survey on specimens deposited in the Museum für Naturkunde Berlin, we found that both *Hypoaspis* (*Hypoaspis*) *eugenitalis* Karg, 1978, and *Hypoaspis* (*Alloparasitus*) *pycnosis* Karg, 1979 not only do not match with the *Hypoaspis s. lat.* concept but also with other genera of the family. So, we erect a new genus with distinctive features to accommodate the taxa mentioned above and redescribe them.

MATERIALS AND METHODS

This work is based on the study of the following materials: mites of *Hypoaspis eugenitalis* and *Hypoaspis pycnosis* as permanent microslides were borrowed from Museum für Naturkunde Berlin (Germany), type material of *Laelantennus* Berlese, 1903 was studied in Istituto Sperimentale per la Zoologia Agraria in Firenze and the information concerning *Myrmolaelaps* Trägårdh, 1906 has been received from Department of Zoology/Invertebrate Zoology, Swedish Museum of Natural History, Stockholm. For other close genera, the original description in related papers and some related species in Acarological Laboratory, Plant Protection Department, Agricultural College, Shahrekord University (APAS) have been used. The data and information on species determination as microslide labels have been cited in the materials examined section for each species. 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. Measurements of structures expressed as minimum-maximum ranges in micrometers (μm) were obtained using the scaled ocular lens of Olympus BX43, equipped with a phase-contrast system. For curved setae and other morphological features that are bent or aligned in the *Z-axis*, high-quality microscopic photographs were taken, and then the length of the curved setae/feature was measured by calibrated Digimizer software (version 4.6.1 MedCalc Software bvba). The dorsal setae notation followed that of Lindquist & Evans (1965). Leg and palpal setal notation and chaetotaxy formulae are based on Evans (1963a, b). The length of the dorsal shield is the distance from its anteromedian edge anterior to bases of setae *j1* to its posteromedian edge posterior to bases of setae *Z5*; the width of the dorsal shield was measured at the widest part; the length of the sternal shield was measured along the midline from anterior edge to its posterior margin, the width measured between coxae II (widest point) and slightly above the insertion of *st2* (narrowest point). The length of the anal shield is midline from the anterior margin to the posterior edge of the cribrum, and the width was measured at the widest point. Setae were measured at the level of insertions to their tips and distance between setae as the distance between their insertions. The lengths of leg segments were measured dorsomedially, and tarsi were measured without the stalk and pretarsus. Notation for pore-like structures as either poroids (lyrifissures) or glandular openings followed that of Athias-Henriot (1969, 1975) and for pore-like structures of the peritrematal region follows that of Moraza and Lindquist (2018). We have attempted to identify all pore-like structures, but we acknowledge that some may have been overlooked. The holotype and paratypes have been deposited in the Museum für Naturkunde Berlin, Germany.

Taxonomy

Hypoaceus gen. nov.

Type species: *Hypoaspis eugenitalis* Karg, 1978

Genus definition (adult female and male)

Dorsal shield with scanty of ornamentation, not covering all dorsal idiosoma and surrounded by soft integument (Figs. 1A, 7A); dorsal shield with 38–39 pairs of smooth pointed setae, variable in length, some setae elongate and often appearing wavy in slide-mounted specimens (Figs. 1A, 2A, 7A). With an extra pair of *zx* setae on the podonotal part, setae *Zx1, Zx2*, or *Zx1-3* absent, setae *z1* on the anterior part of the podonotal region is the smallest on the dorsal shield. An enlarged pore-like structure (pustule-like in appearance) which probably accompanied by *gd6* and *is1* present at the dorso-ventral side of opisthonotal near the setae *Z1*. Tritosternum with columnar base and paired free pilose laciniae. Presternal plates are free and sclerotized. Sternal shield wider than long, concave posteriorly, sternal setae acicular and long, shield with two or three pairs of poroids, *iv1–2* located on the shield surface, *iv3* may be located on the posterior edge of sternal shield or anterior tip of endopodal II-III, setae *st4* absent. Genitiventral shield expanded well posterior to coxae IV, extended to anterior margin of the anal shield with one pair of setae between borders, ornamentation present in the whole surface or restricted to anterior part, with two-three pairs of setae well inside the shield, in addition to epigynal setae (*st5*) on lateral margins. Numerous pore-like structures (poroids) with different sizes present on the genitiventral shield surface (Figs. 1B, 7B, 8) and male holoventral shield (Fig. 5A). Anal shield subtriangular, surface devoid ornamentation, post-anal seta not elongate smaller than para-anal setae. Peritreme extending from posterior margin of coxa III to almost midlevel of coxa I (Figs. 1B, 7B) and peritrematal shield joint with dorsal shield near setae *z1*; post-stigmatal area of shield nearly wide and extended to midlevel of coxae IV. Endopodal plates I-III which merge with the lateral margins of the sternal shield, extended to the midline of coxae III. The endopodal plates of coxae III-IV consists of two interior and exterior plates adjacent to each other, the interior one wide and nearly straight and the exterior angular behind posterolateral corners of the sternal shield, extending to mid or posterior parts of coxae IV joint with well expanded and sclerotized podal and exopodal plate which extends to the area between coxae II-III (Figs. 1B, 2B, C, 7B, 9). Palpcoxal (*pc*) and hypostomal (*h1–3*) setae smooth and simple, *h3* longest. Deutosternal groove with six-seven denticulate rows. Corniculi horn-like (Figs. 3A, 10A). Epistome fairly denticulate (Figs. 3B, 10B), supralabral process similar to the long style-like appendage, labrum slender elongate and pubescent. Chelicerae chelate-dentate and robust, moveable digit with two teeth, dorsal seta distinctive; setiform pilus dentilis short, arthrodial processes developed (Figs. 3C, 10C). Male chelicerae also chelate-dentate, movable digit with one tooth and fixed digit with two teeth, spermadactyle straight and elongate, more than two times of movable digit length and attached to it in one-third of proximal behind the second tooth (Fig. 5B). Male with holoventral shield bearing genital orifice at the antero-medial margin. The shield consists of several pore-like structures distributed between coxae II to the posterior area of coxae IV (Fig. 5A). Palp-tarsal claw two-tined (Figs. 3D, 10D). Legs IV longest, legs III shortest, legs I longer than legs III. Tarsi with developed ambulacra, without elongate setae on segments. Tarsus II both in male and female (Figs. 4, 6B, 11B) bearing strong spur or spine-like setae especially (*av1* and *pv1*). Femur II of male (Fig. 6B) with strong spur-like seta (*pv1*). All legs setae smooth. Chaetotaxy of legs is as follows: **Leg I** (Figs. 6A, 11A): coxa 0 0/1 0/1 0; trochanter 1 0/2 1/1 1; femur 2 2/1 3/3 2; genu 2 3/2 3/1 2; tibia 2 3/2 3/1 2. **Leg II** (Figs. 4, 6B, 11B): coxa 0 0/1 0/1 0; trochanter 1 0/2 0/1 1; femur 2 3/1 2/2 1; genu 2 3/1 2/1 2; tibia 2 2/1 2/1 2; tarsus 3,3/2,3/2,3 + *mv*, *md*. **Leg III** (Figs. 6C, 11C): coxa 0 0/1 0/1 0; trochanter 1 0/2 0/1 1; femur 1 2/1 1/0 1; genu 2 2/1 2/1 1; tibia 2 1/1 2/1 1; tarsus 3 3/2 3/2 3 + *mv*, *md*. **Leg IV** (Figs. 6D, 11D): coxa 0 0/1 0/0 0; trochanter 1 0/2 0/1 1; femur 1 2/1 1/0 1; genu 2 2/1 3/0 1; tibia 2 1/1 3/1 2; tarsus 3,3/2,3/2,3 + *mv*, *md*.

Remarks

The members of the new genus mostly based on the expanded genitiventral shield are similar to some laelapid genera, including *Laelantennus* Berlese, 1903; *Laelapsella* Womersley, 1955; *Laelaspis* Berlese, 1903; *Myrmolaelaps* Trägårdh, 1906, and *Pseudoparasitus* Oudemans, 1902; due

to the absence of *st4* (and also expanded genitiventral shield) is similar to *Laelaspisella* Marais and Loots, 1969, *Pogonolaelaps* Nemati and Gwiazdowicz, 2016 and *Reticulolaelaps* Costa, 1968. *Hypoaceus* **gen. nov.** differs from all the mentioned genera in (i) having numerous poroids on the ventral surface of genitiventral (female) and holoventral (male) shields (ii) an enlarged pore-like structure (pustule-like in appearance) which probably accompanied by *gd6* and *is1* at the lateral margin of dorsal shield near the setae *Z1* (iii) the presence of strong spur or spine-like setae at the apical part of tarsus II in female and male members, and (iv) having a strong spur-like seta on the ventral side of male femur II. In addition to the features summarized in Table 1, we will discuss in more detail the differences between the new genus and the mentioned genera.

Laelantennus was described based on one female specimen, *L. lagena*, as its type species. By examining the type material (the microslide 162/32; with the information of *Laelantennus lagena*, Tipico Berlese, female, Alla? et Jeannell, Africa-Orientale, 2-XII-11, 21) in Berlese Collection (Italy), we found many differences between *Laelantennus* and *Hypoaceus* **gen. nov.** Female of *Laelantennus* has an idiosoma wider than long, while *Hypoaceus* **gen. nov.** has a longer than a wide one. All legs in the former are located at almost one-third of the anterior part of the idiosoma, whereas in the latter genus, legs have a normal situation. In contrast to *Laelantennus* that legs did not have claws and their ambulacral appendages are big, *Hypoaceus* **gen. nov.** has both claws and the normal ambulacral appendages. Moreover, *Laelantennus* otherwise readily distinguished from *Hypoaceus* **gen. nov.** by epistome smooth at the anterior margin (fairly denticulate in the new genus); obvious stigmatal opening located at the posterior area to coxae IV (stigma located in the area between coxae III-IV in the new genus), and presence of st4 (absent in the new genus).

There are other meaningful differences between *Laelapsella* (based on characters in the original description in Womersley 1955) and *Hypoaceus* **gen. nov.** Presternal plates are well sclerotized in the new genus while they are absent in the species of *Laelapsella*. Furthermore, the genitiventral shield has seven-eight pairs of marginal and submarginal setae in *Laelapsella*, but it bears only three pairs of setae in *Hypoaceus* **gen. nov.** In the species of *Laelapsella*, the *av* seta of coxae II and III is strong and spine-like, and spermadactyle is as long as a movable cheliceral digit. By contrast, members of *Hypoaceus* **gen. nov.** have a normal *av* seta on coxae II-III, and the spermadactyle is at least twice longer than the movable cheliceral digit. Compared with *Laelaspis* (based on characters in Hunter 1961 and Kazemi 2015), *Hypoaceus* **gen. nov.** species have a fairly denticulate epistome; the separate and reticulated presternal shield, and three setae on the genitiventral shield. In *Laelaspis* species, epistome is smooth anteriorly, presternal plates are normally fused with the anterior margin of the sternal shield, and the genitiventral shield doesn't have setae on the surface well inside. Comparison of the male individual indicates that in contrast to *Laelaspis*, the males of *Hypoaceus* **gen. nov.** have spermadactyle more than two times as movable cheliceral digit length.

Laelaspisella (based on characters in the original description in Marais and Loots 1969) bears hypertrichous condition on dorsal shield (lacking in *Hypoaceus* **gen. nov.**); genua I lack one post-dorsal seta (genua I with normal condition of six setae on dorsal side in *Hypoaceus* **gen. nov.**); dorsal cheliceral seta absent (present in the new genus); epigynal shield bears one pair of setae (genitiventral shield with three pairs of setae in the new genus); setae *Zv5* and *Jv5* spatulate (all opistogastric setae are normal in *Hypoaceus* **gen. nov.**); genua IV with two ventral setae: *av* and *pv* (only with *av* in *Hypoaceus* **gen. nov.**); epistome acuminate and smooth in anterior and lateral margins (fairly denticulate in *Hypoaceus* **gen. nov.**).

Myrmolaelaps (based on the characters in the original description in Trägårdh (1906) and other information on type material) differs from *Hypoaceus* **gen. nov.** in a number of other important ways as follows. *Myrmolaelaps* without expanded podal plate (podal plates expanded in the new genus); and curniculi are long and extending to midlevel of palp femur (not similar to this character in the new genus). However, some setae on tarsus II are slightly thicker than the others in the segment, but they are not similar to spine-like setae (spur or spine-like setae present on tarsus II in the new genus). Besides, the epistome in *Myrmolaelaps* is smooth anteriorly while it is fairly denticulate in the new

genus. *Hypoaceus* **gen. nov.** has numerous pore-like structures on the ventral surface of the genitiventral shield, lacking *st4*, while *Myrmolaelaps* has *st4* but lacking pore-like structures on the genitiventral shield.

Table 1. Some of diagnostic characters for some genera of Laelapidae mites having similarities with *Hypoaceus* **gen. nov.**

Genus	Character								
	Expanded epigynal shield (genitiventral sh.)	Seta *st4*	Numerous pore-like structures on female and male ventral surface	Strong spur-like setae at apical part of tarsus II	Strong spur-like seta on ventral side of male femur II	Epistome	Setae on genitiventral shield	spermadactyle	Apotele tines
***Hypoaceus* gen. nov.**	+	−	+	+	+	fairly denticulate	three pairs	at least two times longer than movable cheliceral digit	two
***Laelantennus* Berlese, 1916**	+	+	−	−	(1)	smooth at the anterior margin	(2)	(1)	two
***Laelaspisella* Marais and Loots, 1969**	+	+	−	−	−	acuminate and smooth in anterior and lateral margins	one pair	(1)	two
***Laelapsella* Womersley, 1955**	+	+	−	−	−	smooth	seven-eight pairs	as long as movable cheliceral digit	two
***Laelaspis* Berlses, 1903**	+	+	−	−	−	smooth at anteriorly	one-three	less than two times of movable digit	two
***Myrmolaelaps* Trägårdh, 1906**	+	+	−	−	−	smooth anteriorly	(2)	(2)	two
***Pogonolaelaps* Nemati and Gwiazdowicz, 2016**	+	−	−	−	−	acuminate and smooth	one	one pair of setae (*st5*) on shield and three pairs of setae adjacent to lateral edges	three
***Pseudoparasitus* Oudemans, 1902**	+	+	−	−	−	fairly denticulate	three	small or nearly as long as movable or slightly longer	three
***Reticulolaelaps* Costa, 1968**	+	−	−	−	−	smooth laterally and anteriorly	three-six	short and straight	two

+ = present, − = absent

(1) Male has not been described. (2) Type specimen lacking enough quality to see the details.

Pogonolaelaps [based on original description in Nemati and Gwiazdowicz (2016)] species with acuminate and smooth epistome (epistome fairly denticulate in *Hypoaceus* **gen. nov.**); genua IV with 10 setae encompass two ventral setae: *av* and *pv* (genua IV in the new genus with 9 setae bearing only one ventral seta: *av*); genitiventral shield broad, abutting anal shield, with one pair of setae (*st5*) on shield and three pairs of setae adjacent to lateral edges (genitiventral shield with two-three pairs of setae well inside the surface in *Hypoaceus* **gen. nov.**); the most dorsal shield setae with a knob at base (setae on dorsal shield without knob at base in new genus); male with separate anal shield (male with holoventral shield in *Hypoaceus* **gen. nov.**); the internal malae free medially and densely fringed, in addition possess two detachments of densely and very elongate hairs at basal part of each internal mala (internal malae without such characters in the new genus); palp-tarsal apotele three-tined (apotele with two tines in *Hypoaceus* **gen. nov.**).

All known members of *Pseudoparasitus* [based on characters in Hunter (1966) and Nemati *et al.* (2019)] have *st4* setae (setae *st4* absent in *Hypoaceus* **gen. nov.**); palp-tarsal apotele three-tined (apotele with two tines in *Hypoaceus* **gen. nov.**); genitiventral shield lacking pore-like structures on the surface (*Hypoaceus* **gen. nov.** with numerous pore-like structures with different sizes on the genitiventral shield surface); all known members of *Pseudoparasitus* males with small spermadactyle nearly as long as movable or slightly longer than it and devoid strong spine or spur-like setae on femur II (the spermadactyle in *Hypoaceus* **gen. nov.** male is about twice longer than movable cheliceral digit and with strong spur-like seta on the ventral side of femur II); in all known species of *Pseudoparasitus* setae *Zv1* located at lateral margins of genitiventral shield (setae *Zv1* located well inside the genitiventral shield in *Hypoaceus* **gen. nov.**). Differences between *Reticulolaelaps* [based on characters in Moraza (2019) and Nemati *et al.* (2019)] and *Hypoaceus* **gen. nov.** can be listed as follow: epistome with smooth lateral and anterior margins (epistome in *Hypoaceus* **gen. nov.** bears deeply teeth); hypostomal groove narrow, with four rows bearing few denticles (hypostomal groove with six-seven multidentate rows in *Hypoaceus* **gen. nov.**); palp trochanter with a large membranous flap originating as an extension of the paraxial margin (*Hypoaceus* **gen. nov.** without such structure); spermatodactyl short and straight (the spermadactyle in *Hypoaceus* **n. gen**. male is about two times longer than movable cheliceral digit); genitiventral shield lacking some pore-like structures on the surface (*Hypoaceus* **gen. nov.** with numerous pore-like structures on the genitiventral shield surface).

Etymology

The name of the new genus *Hypoaceus* is a component of the words "*Hypo*" referring to the similar *Hypoaspis sensu lato* and the Latin adjective suffix "*aceus*" emphasizing the similarity to this group of mites.

***Hypoaceus eugenitalis* (Karg, 1978) (Figs. 1–6)**

Hypoaspis (*Hypoaspis*) *eugenitalis* Karg, 1978: 22.
Hypoaspis (*Alloparasitus*) *eugenitalis* – Karg 1979: 75; Karg 1982: 237; Karg 1989: 119; Huhta and Karg 2010: 328.
Laelaspis eugenitalis – Freira 2007: 209.
Alloparasitus eugenitalis – Casanueva 1993: 157; Moreira 2014: 109.
Hypoaspis (*Hypoaspis*) *eugenitalis* – Nemati and Gwiazdowicz 2016: 43.

The most taxonomic names mentioned above, have been cited in Moreira (2014).

Specimens examined

Type materials of this species have been collected from Chile, Valdivia, Misituni. In Museum für Naturkunde Berlin two microslides (one female and one male) were collected from Chile: female specimen, ZMB Nr. 40148, Slide Number 4033, 12.01.1965; male specimen, ZMB Nr. 40147, Slide

Number 4032, 10.24.1965. All other specimens designated as *Hypoaspis eugenitalis* deposited in Museum für Naturkunde Berlin; three alcoholic tubes with numbers of: ZMB Nr. 40135, Argentina, Alkoholpraparate (Karg-Nr.) 1183, 1965; ZMB Nr. 40136, Chile, Alkoholpraparate (Karg-Nr.) 1184, 1965 and ZMB Nr. 40137, Argentina, Alkoholpraparate (Karg-Nr.) 1185, 1961 contain 50, 2 and 2 mites respectively. The microslides: ZMB Nr. 40138, female, South America, Argentina, Slide Number 4018, 10.12.1961; ZMB Nr. 40139, female, South America, Argentina, Slide Number 4024, 10.30.1961; ZMB Nr. 40140, female, South America, Argentina, Slide Number 4025, 11.13.1961; ZMB Nr. 40141, male, South America, Argentina, Slide Number 4026, 11.13.1961; ZMB Nr. 40142, male, South America, Argentina, Slide Number 4027, 09.26.1961; ZMB Nr. 40143, male, South America, Argentina, Slide Number 4028, 10.12.1961; ZMB Nr. 40144, male, South America, Argentina, Slide Number 4029, 06.14.1961; ZMB Nr. 40145, female, South America, Argentina, Slide Number 4030, 07.18.1961; ZMB Nr. 40146, female, South America, Argentina, Slide Number 4031, 11.09.1961. The following slides based on their qualities have been used for drawings (the information presented here is based on the data on microslide labels): *Hypoaspis eugenitalis* Karg, female, Chel. No. 4018. Argentinien, Rio Negro, El Bolson, Votgeb. d. Piltriquitron, 460m, Laubstreu, 12.10.61; *Hypoaspis eugenitalis* Karg, 1978, female, Chel. No. 4024. Argentinien, Rio Negro, El Bolson, Vorberg vom Mt. Piltriquitron, 400m, Laubstreu, 30.10.61; *Hypoaspis eugenitalis* Karg, 1978; Chel. B. II, 4026; [ZMB Kat. Nr. 40141]; Male, Argentinien, Rio Negro, El Bolson, Berg, Piltriquitron, 1170m, Moosiges, Gras vom Rande eines Nothofagus-Waldes, 13.11.61; *Hypoaspis eugenitalis* Karg, 1978, Male, No. 4029. Argentinien, Rio Negro, El Bolson, Piltriquitron, 480m, Frisches Moos von Fels, 14.04.61.

Diagnosis

Setae *r6* located on soft cuticle, *Zx3* present, dorsal setae *Z4-5* and *S4-5* are more elongate than the others; epistome with fair denticles in lateral and anterior margins; bearing a supralabral process as a slender and pointed style; genitiventral shield reticulated throughout with pore-like structures on surface; the *gd6* pustule like; male holoventral shield bears several pore-like structures on the surface.

Description (Female)

Dorsal idiosoma (Fig. 1A) – Dorsal idiosoma oval-shaped, (878–889) long, (623–650) wide, with scanty ornamentation throughout, holotrichous both in podonotal and opisthonotal parts; with 23 pairs of setae on podonotal region including of one pair of extra paired setae (*zx*) between *z2–z3*, dorsal setae designated as *j1–6; z1–6* and one pair of *zx; s1–6* and *r2–5*. Opisthonotal area of shield with 16 pairs of setae designated *J1–5*; *Z1–5*; *S1–5* and one pair of *Zx3*. setae *z1* is the shortest (Fig. 2A), and *S5* the longest (Fig. 1A). Most dorsal shield setae moderate or elongate. The sizes of dorsal shield setae are as follows: *j1*: 60–63; *j2–5*: 93–102; *j6*: 70–73; *z1*: 23–25; *z2–6*: 89-93; *s1–6*: 99–112; *r2*: 77–80; *r3–5*: 99–113; *J1–3*: 70–74; *J4--5*: 102–120; *Z1*: 129–132; *Z2*: 80–84; *Z3*: 120–124; *Z4*: 150–168; *Z5*: 155–162; *S1*: 90–95; *S2–3*: 100–109; *S4*: 145–156; *S5*: 185–197; *Zx3*: 84–91. Dorsal shield with 19 pairs of pore-like structures, an enlarged pore like structure (pustule-like in appearance) which probably accompanied by *gd6* and *is1* at dorso-marginal side of opisthonotal region (bent down in ventral side of Fig. 1B) present near the setae *Z1*.

Ventral idiosoma (Fig. 1B) – Tritosternum with columnar base 65–72 long, 20–24 wide, and pilose laciniae 182–190 long. Pre-sternal plates well sclerotized with 68–72 long and 25–28 wide with fair striae on surface. Sternal shield (Figs. 1B, 2B, C) 141–145 long, 178–183 wide at level of setae *st2* and 352–358 at level of lateral projections between coxae II-III, ornamented throughout, except in medio-posterior area which is smooth, anterior and posterior margins of shield concave, lateral margins alongside coxae II-III fused with endopodal plates. Sternal shield with three simple acicular pairs of setae, *st1*: 83–86, *st2*: 105–108, *st3*: 103–105; the distances between sternal setae: *st1-st1*: 90–96, *st2-st2*: 105–108, *st3-st3*: 201–206, *iv1–2* slit-like, *iv1* located between *st1* setae, distance between *iv1–iv1* 10–12, *iv2* located between *st2–3* almost at level of projection between

coxae II-III, *iv2-iv2* 191–199. Setae *st4* absent and lyrifissures *iv3* located on postero-corner of sternal shield at the tip of interior section of endopodal III-IV (Figs. 2B, C). Genitiventral shield 462–475 long, 289–292 wide at level of genital setae, 451–460 wide at widest part, bearing three pairs of setae including genital setae, *st5*: 100–103, *Zv1–2*: 138–146, *Jv1–2*: 69–92, paragenital lyrifissure (*iv5*) located on the surface of podal plate at level of genital setae (Figs. 2B, C). Genitiventral surface fairly reticulate and bears numerous of different sized pore-like structures. Metapodal plates only could be seen in some specimens and almost fused with lateral margins of genitiventral shield (Fig. 2C). Anal shield subtriangular with anterior margin convex, 127–139 long, 224–231 wide; paranal setae acicular (43–49), post-anal seta (23–26), gland pores *gv3* on lateral margins of anal shield. Cribrum normally developed posteriorly and laterally around postanal seta. Stigma located at posterior level of coxa III, stigmatal plate ending in a poststigmatal extension of peritrematal shield (Fig. 1B) bears two-three pore-like structures. Peritreme anteriorly extending to mid-level of coxa I, peritrematal shield at level of coxae II-III bearing *gd3* accompanied by *id3* and small shoulder shield present near coxa I. Podal, endo- and exopodal plates described in genus definition.

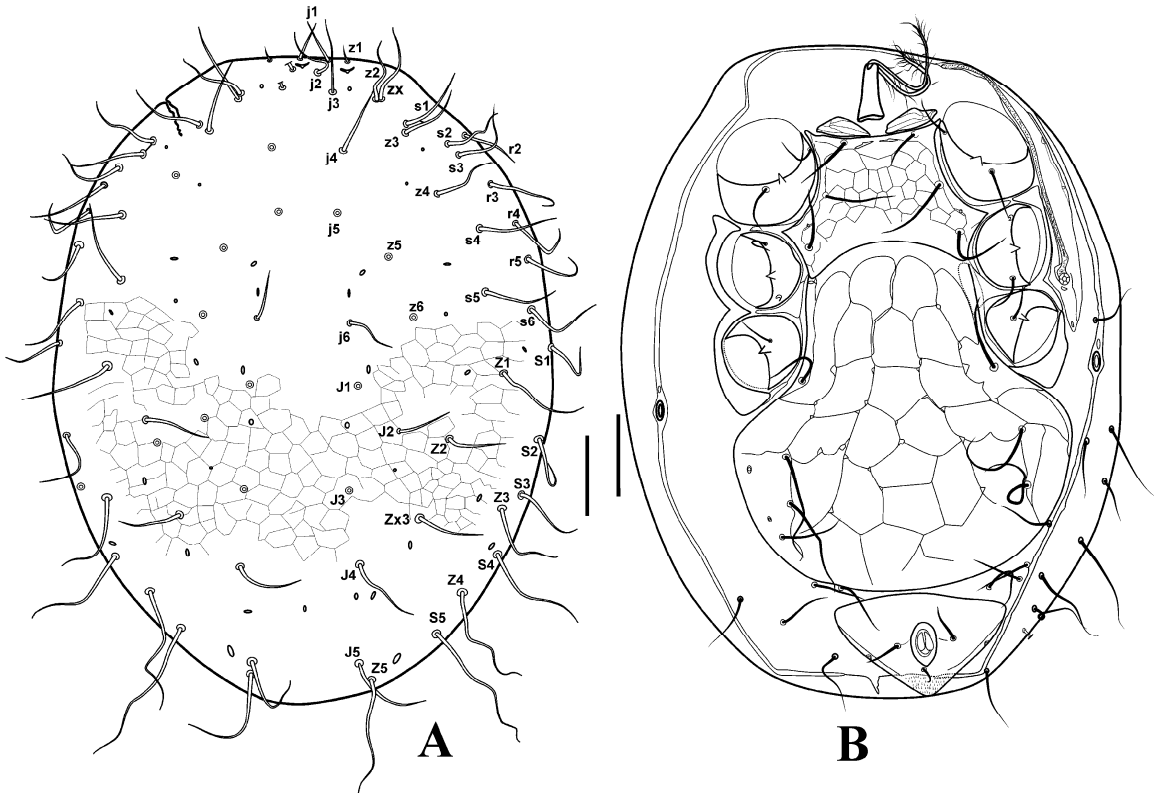

Figure 1. Holotype female of *Hypoaceus eugenitalis* (Karg, 1978) – **A.** Dorsal idiosoma; **B.** Ventral idiosoma. Scale bars: 100 μm.

Gnathosoma (Figs. 3A–D) – Setae *h1* and *h2* (59–67), *h3* (69–73); palpcoxal seta (*pc*) 49–55 long. Deutosternal groove with seven multidenticulate rows. Corniculi horn-like, with 54–59 long, 6–10 wide at midlevel, internal malae complex, with two pairs of lobes, inner lobes slender and long (55–60), lateral lobes smaller (29–33), wider with short hairs, extending to the midlevel of curniculi (Fig. 3A). Epistome (Fig. 3B) acuminate and fairly denticulate, with prominent denticles at anterior and lateral margins. Supralabral process style like.

Chelicerae (Fig. 3C) – With setaceous dorsal seta (21–25), arthrodial process and lateral lyrifissure; movable digit 68–75 long medially from top to posterior margin, with two teeth, middle article (152–157) ending in fixed digit (70–79 long from top to level of dorsal seta), bearing two distal, one large tooth at midlevel and one smaller proximal tooth in addition to distal hook, small

needle-like pilus dentilis alongside the larger cheliceral tooth. Palp segment lengths as follows: trochanter (55–61), femur (75–81), genu (47–55), tibia (39–44) and tarsus (23–27), palp chaetotaxy (Fig. 6D) normal (*sensu* Evans & Till 1965), with smooth acicular setae, palp-tarsal claw two-tined (Fig. 3D). Labrum (Fig. 3A) slender and pubescence.

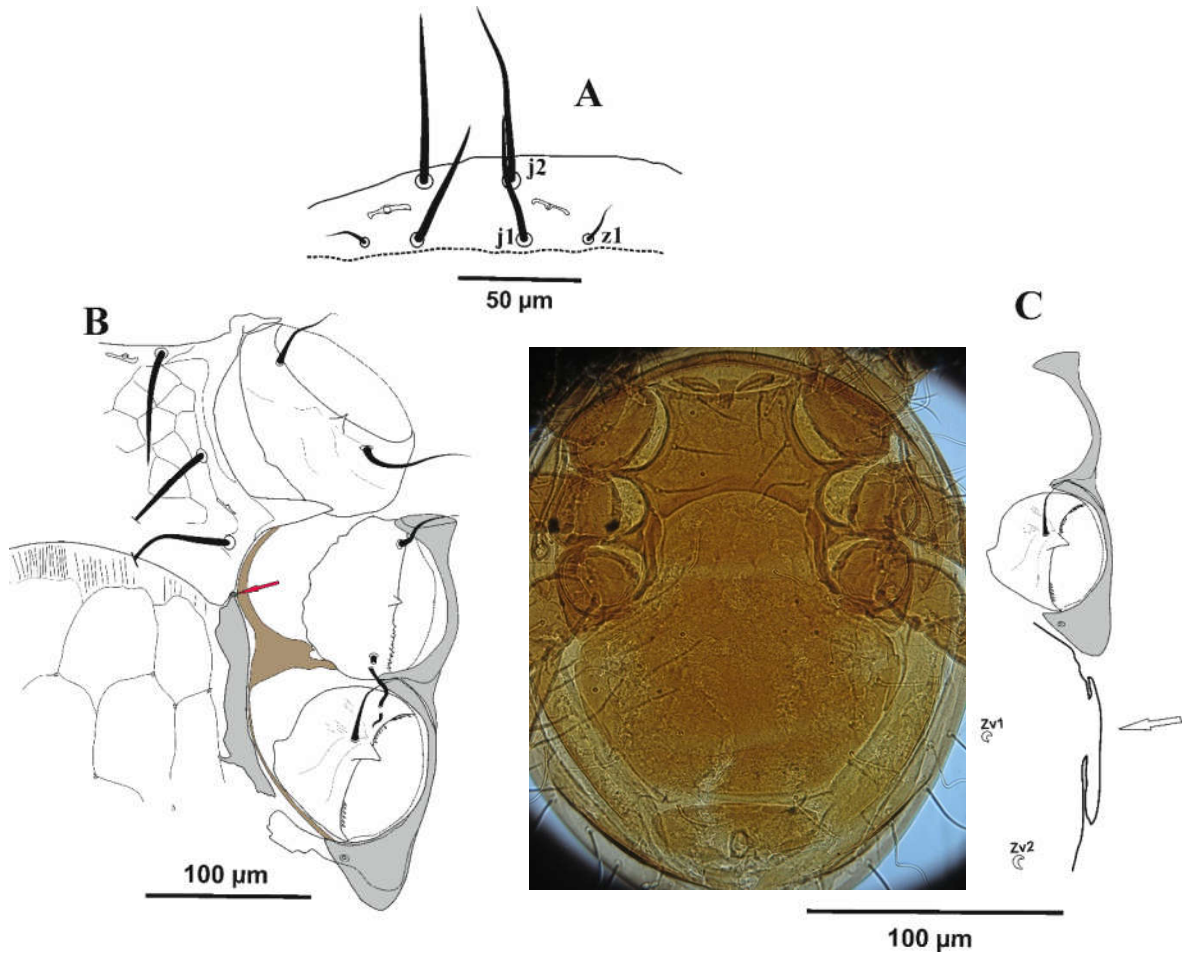

Figure 2. Paratype female of *Hypoaceus eugenitalis* (Karg, 1978) – **A.** Anterior margin of dorsal shield; **B.** Details of endopodal and exopodal plates; **C.** Metapodal plate.

***Legs* (Fig. 4, 6A–D) –** Tarsi I-IV with developed claws and ambulacra, female and male specimens with similar legs setae (Figs. 6A, 6C, D) except legs II (Figs. 4, 6B). **Leg I** (Fig. 6A) 761–802 long, coxa (88–95), trochanter (60–65), femur (161–164), genu (107–116), tibia (114–129), tarsus (231–233); **leg II** (Fig. 4) 535–669 long, coxa (51–61), trochanter (86–91), femur (95–116), genu (84–86), tibia (74–82), tarsus (145–166); **leg III** (Fig. 6C) 529–588 long, coxa (53–55), trochanter (80–89), femur (110–113), genu (75–90), tibia (63–75), tarsus (148–166); **leg IV** (Fig. 6D) 666–801 long, coxa (52–69), trochanter (95-106), femur (121–163), genu (81–103), tibia (95–109), tarsus (222–251). All leg setae smooth, some spur or spine-like as in Figures 4, 6B. Chaetotaxy of legs is as same as in genus (see above). The situation of setae thickness in male and female is similar in all legs except leg II which separately figured in both sexes. **Leg I** (Fig. 6A): In trochanter *al* and in femur *pd2-3* slightly thicker than the other setae on the segment. **Leg II** (Fig. 4): in tarsus setae *mv*, *av2*, *pv2*, *al1*, and *md* spine-like and thicker than other setae on the segment; setae *av1* and *pv1* strong spine-like. **Leg III** (Fig. 6C): in tarsus setae *mv*, *av1-2*, *pv1*, *al1* and *pl1* thicker than the others on the segment. **Leg IV** (Fig. 6D): femur (*ad2* and *pd* thicker than the others on the segment) and genu (*pl* slightly thicker than other setae on the segment).

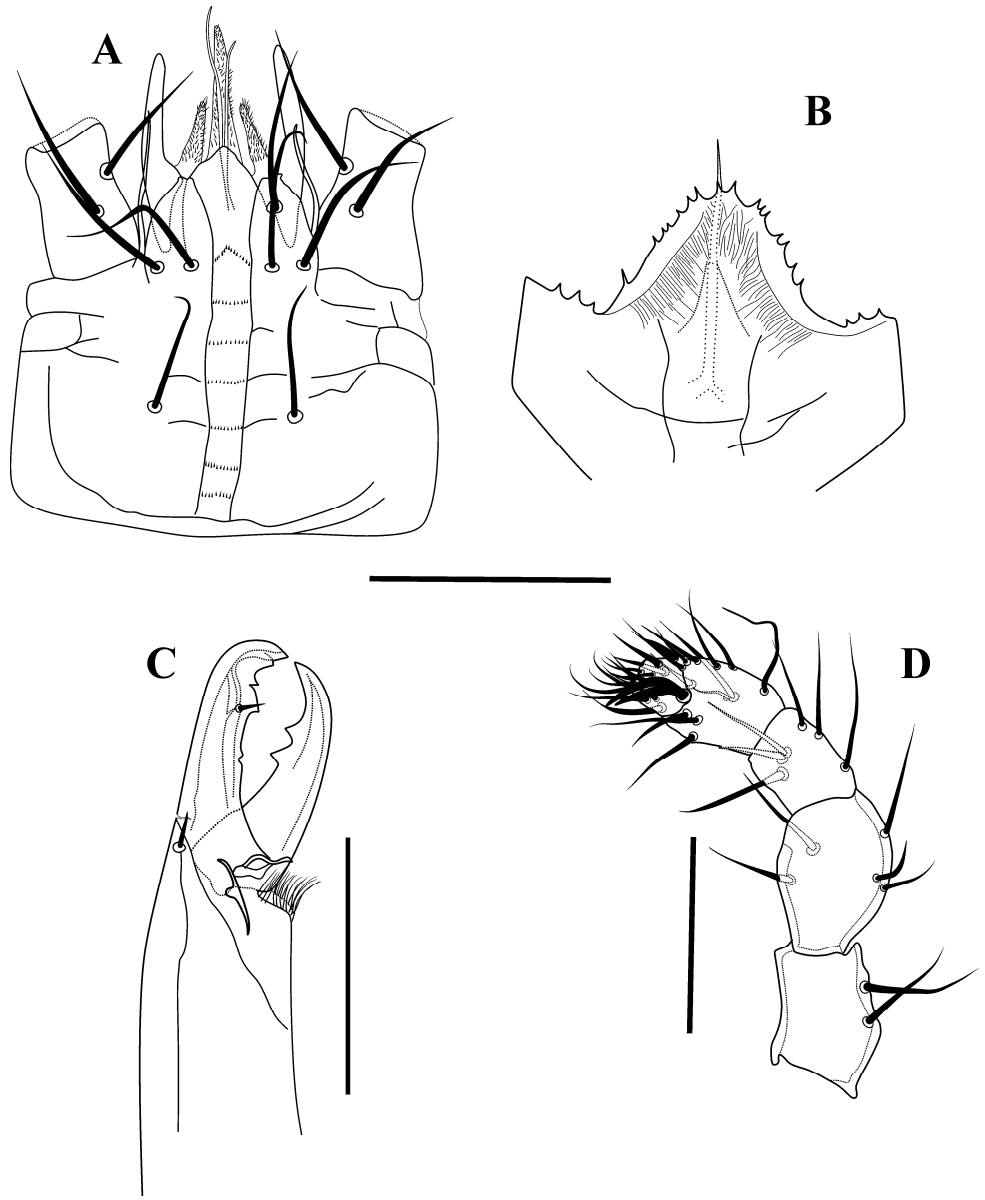

Figure 3. Paratype female (No. 4018) of *Hypoaceus eugenitalis* (Karg, 1978) – **A.** Hypostome; **B.** Epistome and supralabral process; **C.** Chelicera; **D.** Palp (anterolateral view). Scale bars: 100 µm.

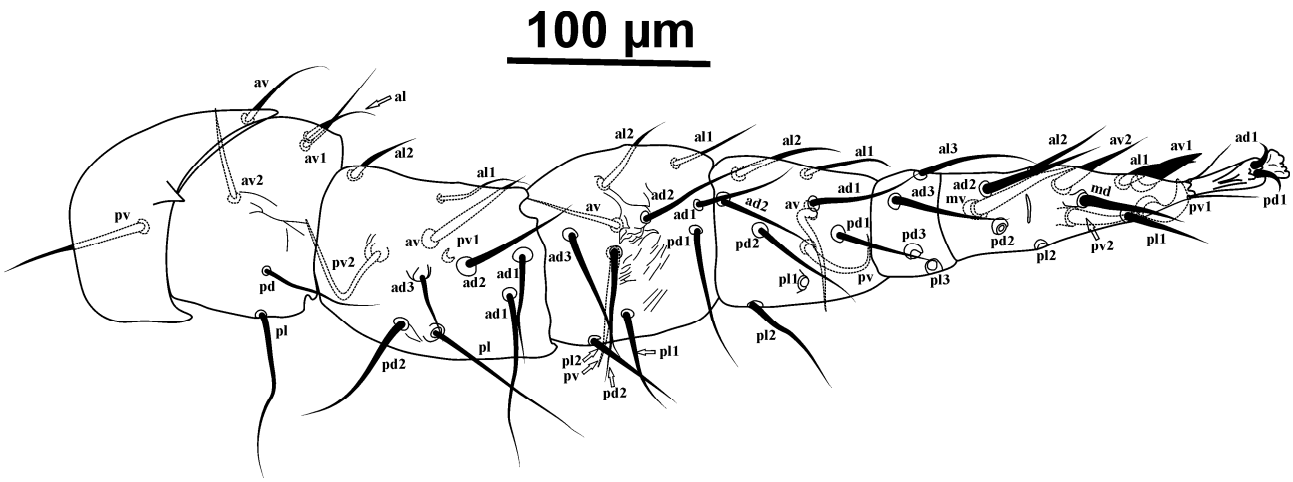

Figure 4. Paratype female (No. 4024) of *Hypoaceus eugenitalis* (Karg, 1978) – Right leg II, dorsal view.

Male (Figs. 5–6).

Dorsal idiosoma – Dorsal idiosomal length 729–734 width 491–545. Dorsal shield chaetotaxy similar to female with slightly smaller setae.

Ventral idiosoma (Fig. 5A) – With one pair of presternal plates with striae on surface located at either sides of genital orifice at anterior middle part of holoventral shield. Holoventral shield with ornamentation observed in anterior part, 152–163 wide in area of *st2*, expanded posterior to coxae IV and created the widest part (389–403 wide posterior to coxae IV) then tend to be irregularly pointed toward the anus. Numerous pore-like structures present on the surface of the shield at level of *st3* to area posterior to coxae IV (Fig. 5A). The shield bearing 10-11 pairs of smooth acicular setae. Lyrifissures *iv1–2* slit-like located at base of *st1* and between *st2-st3* respectively, *iv3* slit-like between *st3-st4*. Endopodals fused with holoventral shield from anterior level of coxae II to area adjacent to midlevel of coxae IV. Stigmatal opening surrounded by wide peritrematal shield. Posterior extension bear three pore-like structures [*is1*, *gp3*, *ip3* following Moraza and Lindquist (2018)]. The broad peritrematal plate with widest area at level of coxae II-III, bearing *gp2* and *ip2* following Moraza and Lindquist (2018). Peritreme long, extended to anterior margin of coxa I.

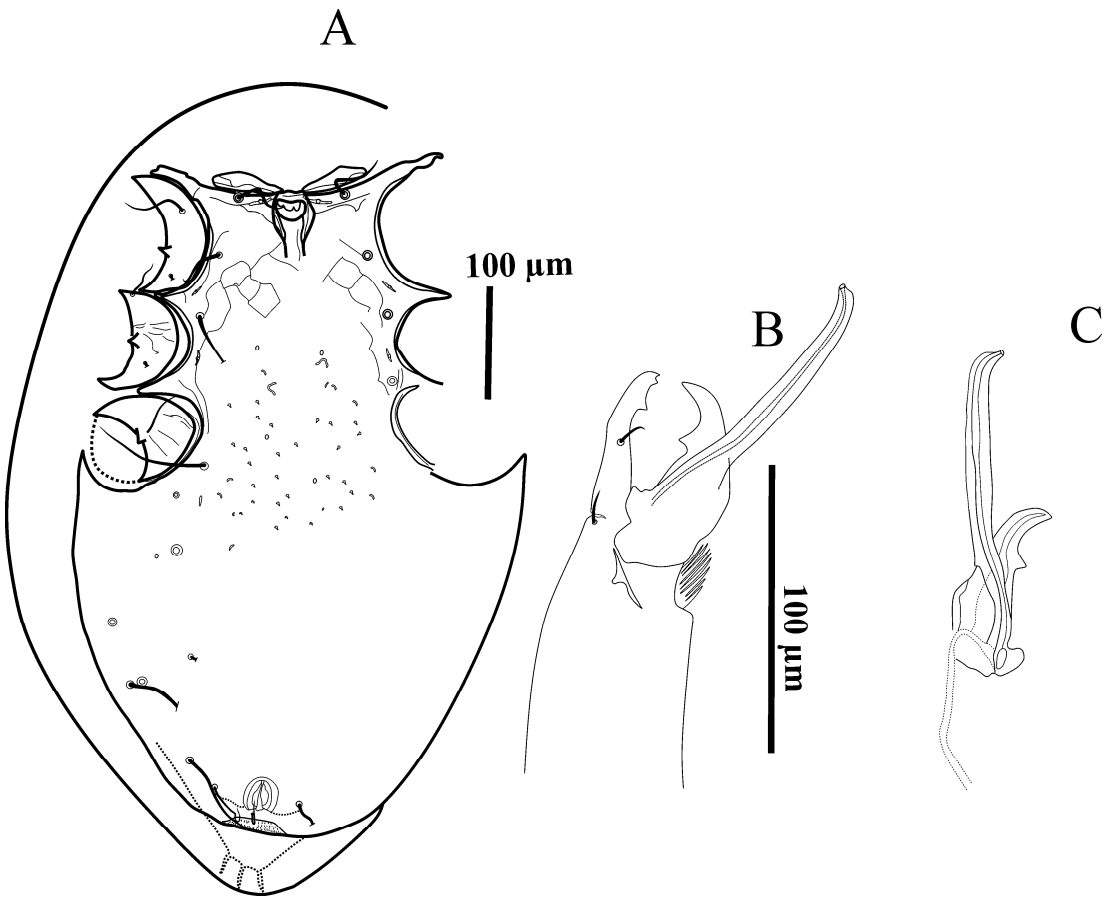

Figure 5. Male of *Hypoaceus eugenitalis* (Karg, 1978) – **A.** Ventral idiosoma; **B.** Chelicera; **C.** Movable cheliceral digit and spermadactyle.

Gnathosoma – Movable digit (170–175) of chelicera with one large tooth (Fig. 5B), spermatodactyl (260–266 long: from anterior tip to the attachment place to movable digit) much longer than movable digit, bent apically over it, with a small pore-like structure at distal bend which connected to a longitudinal tube inside the spermadactyl extended to a small fossa basally at basal part of movable digit (Fig. 5C). Fixed digit with two teeth. Dorsal seta, cornet-shape setae, lyrifissure and setaceous pilus dentilis are present.

Legs (Figs. 6A–D) – Tarsi I-IV with developed claws and ambulacra, legs setae of male specimens are similar to female except legs II (Figs. 6B). **Leg I** (Fig. 6A) 738–788 long, coxa (90–98), trochanter (50–60), femur (158–165), genu (110–113), tibia (122–134), tarsus (208–218); **leg II** (Fig. 6B) 559–615 long, coxa (51–61), trochanter (87–90), femur (101–128), genu (85–89), tibia (85–92), tarsus (150–155); **leg III** (Fig. 6C) 473–506 long, coxa (53–54), trochanter (66–68), femur (86–98), genu (64–70), tibia (60–69), tarsus (144–147); **leg IV** (Fig. 6D) 651–725 long, coxa (56–61), trochanter (78–103), femur (128–145), genu (92–96), tibia (90–93), tarsus (207–227). All leg setae smooth, some spine-like as in Figs. 6B, C. Chaetotaxy of legs is as same as in genus (see above). The chaetotaxy and setae thickness in male and female legs are similar except legs II. Seta *pv1* in male femur II is strong spur-like, *av1* and *pv1* in tarsus II are strong spine-like setae (Fig. 6B).

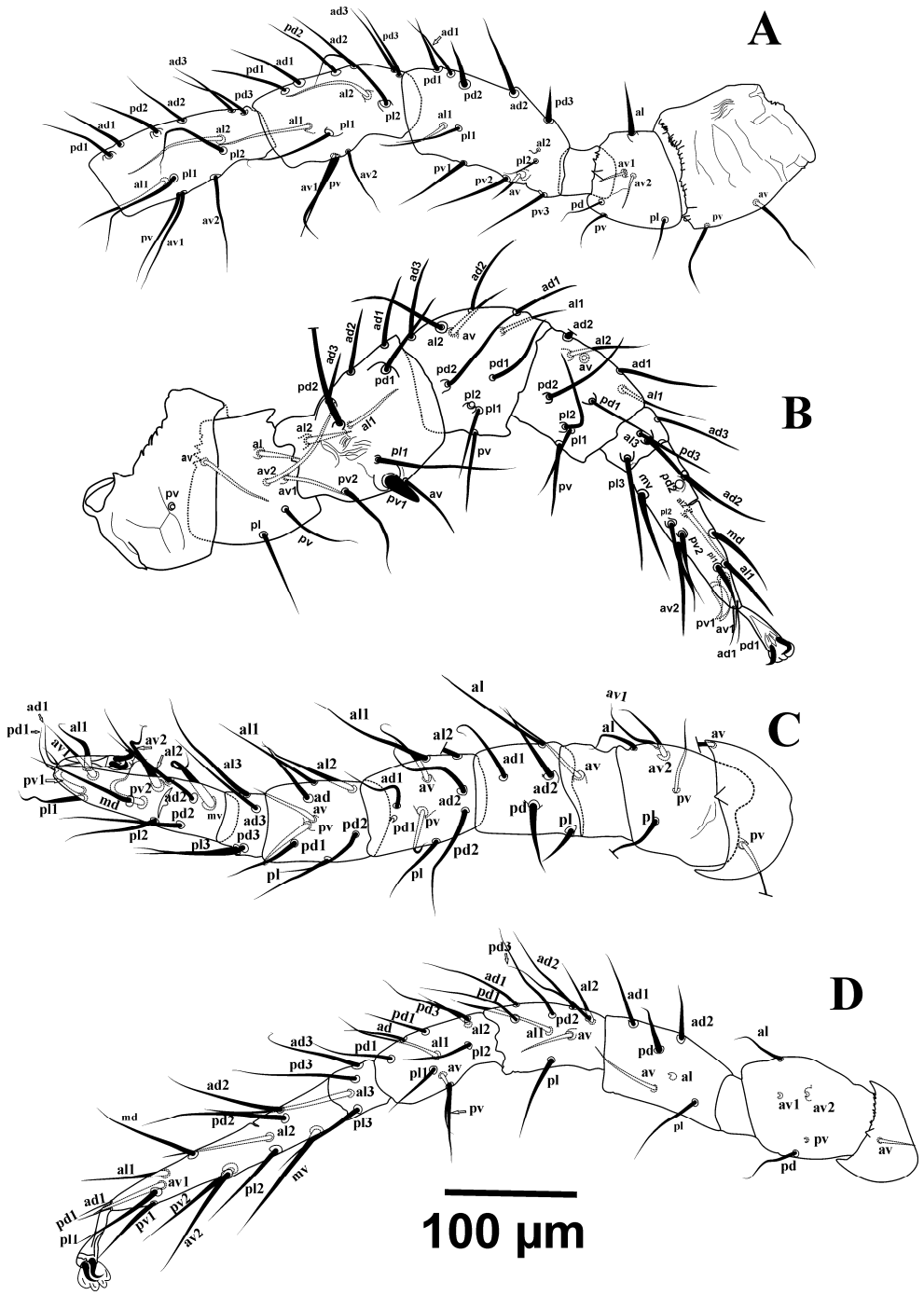

Figure 6. Male of *Hypoaceus eugenitalis* (Karg, 1978) – **A.** Left leg I, anterolateral view; **B.** Right leg II, lateral view; **C.** Left leg III, dorso-ventral view; **D.** Left leg IV, lateral view.

Hypoaceus pycnosis (Karg, 1979) (Figs. 7–11)

Hypoaspis (*Alloparasitus*) *pycnosis* Karg, 1979: 77.
Hypoaspis (*Alloparasitus*) *pycnosis* – Karg 1982: 237; Karg 1989: 119; Nemati and Gwiazdowicz 2016: 43.
Hypoaspis (*Alloparasitus*) *pygnosis* (sic). – Huhta and Karg 2010: 328.
Alloparasitus pycnosis – Casanueva 1993: 157.
Laelaspis pycnosis – Freira 2007: 213.

The most taxonomic names mentioned above, have been cited in Moreira, 2014.

Specimen examined

Hypoaspis pycnosis Karg, 1979; Chel. Nm. 4080; ZMB Kat. Nr. 41150; Paratypus Argentinien, Rio Negro, El Bolson, Tal d. Rio Azul; 340m. Laubstrcu in Libocedrus-Lomatia-Wald, 10.10.61.

Note

While the above-mentioned slide was the only one in Museum für Naturkunde Berlin but marked as a paratype. Moreira (2014) recorded the type depository of this species in Naturwissenschaftlichen Museum, Budapest, Hungary. On the other hand, Karg (1979) himself has mentioned some ranges for some of the traits measurements of this species in its original description, which probably indicates that this species has more than one slide.

Diagnosis

Setae *Zx* absent; dorsal setae not elongate (33–63); genitiventral shield well expanded posterior to coxae IV, reticulated at anterior part; epistome with fair denticles in anterior margin, supralabral process wider and similar to long style.

Description (Female)

Dorsal idiosoma (Fig. 7A) – Dorsal shield oval-shaped, 753 long, width at level of setae *r3* 556; avoid ornamentation throughout, shield with 38 pairs of thin and simple setae, 23 pairs on podonotal region including *j1–6*; *z1–6*; *s1–6*; *r2–5* and one extra paired *zx* setae between *z3-z4*; and 15 pairs on opisthonotal part encompasses of *J1–5*, *Z1–5*, *S1–5*; setae *Zx2–3* absent, the distance of *J2-J2* is about twice of *J1-J1* distance. Dorsal setae varies in length: in podonotal the setae *z1* shortest (13), the others 37–63; in opisthonotal area 33–57. Cuticle between dorsal and ventral side of body bearing *r6* at ventral side. Podonotal and opisthonotal regions with 11 pairs of discernable pore-like structures, as shown in Fig. 7A. It is worth mentioning that the dashed lines in Fig. 7A only indicate the location of the folded parts in the representative specimen on the slide. Obviously, the setae and the related discernible pore and pore-like structures have been displayed on the dorsal surface. An enlarged pore like structure (pustule-like in appearance) which probably accompanied by *gd6* and *is1* present at dorso-ventral side of opisthonotal near the setae *Z1*.

Ventral idiosoma (Fig. 7B) – Tritosternum bearing columnar base with 27 long, 12 wide at middle part and 28 basally, the laciniae was broken and not observed. Pre-sternal with a pair of slightly sclerotized plates with striae on surface. Sternal shield with reticulation except in posterior surface, 111 long, 168 wide at level of *st2* and 286 at level of projection between coxae II-III, slightly concave at anterior margin and deeply at posterior. Sternal setae smooth, *st1* (59), *st2* (74) and *st3* (83), the distances of *st1-st1* (78), *st2-st2* (123), *st3-st3* (164), *st1-st2* (59), *st2-st3* (53); *iv1–2* slit-like, located slightly behind *st1* and between *st2-st3* respectively. Metasternal setae absent; *iv3* ovoid, located on postero-corner of sternal shield. Genitiventral shield well expanded posterior to coxae IV, extending to area adjacent to anterior margin of anal plate, reticulated at anterior surface, bearing

several pore-like structures on the surface (Fig. 8), with 368 long, 233 wide at level of st5, 360 at level of *Zv1* in widest part.

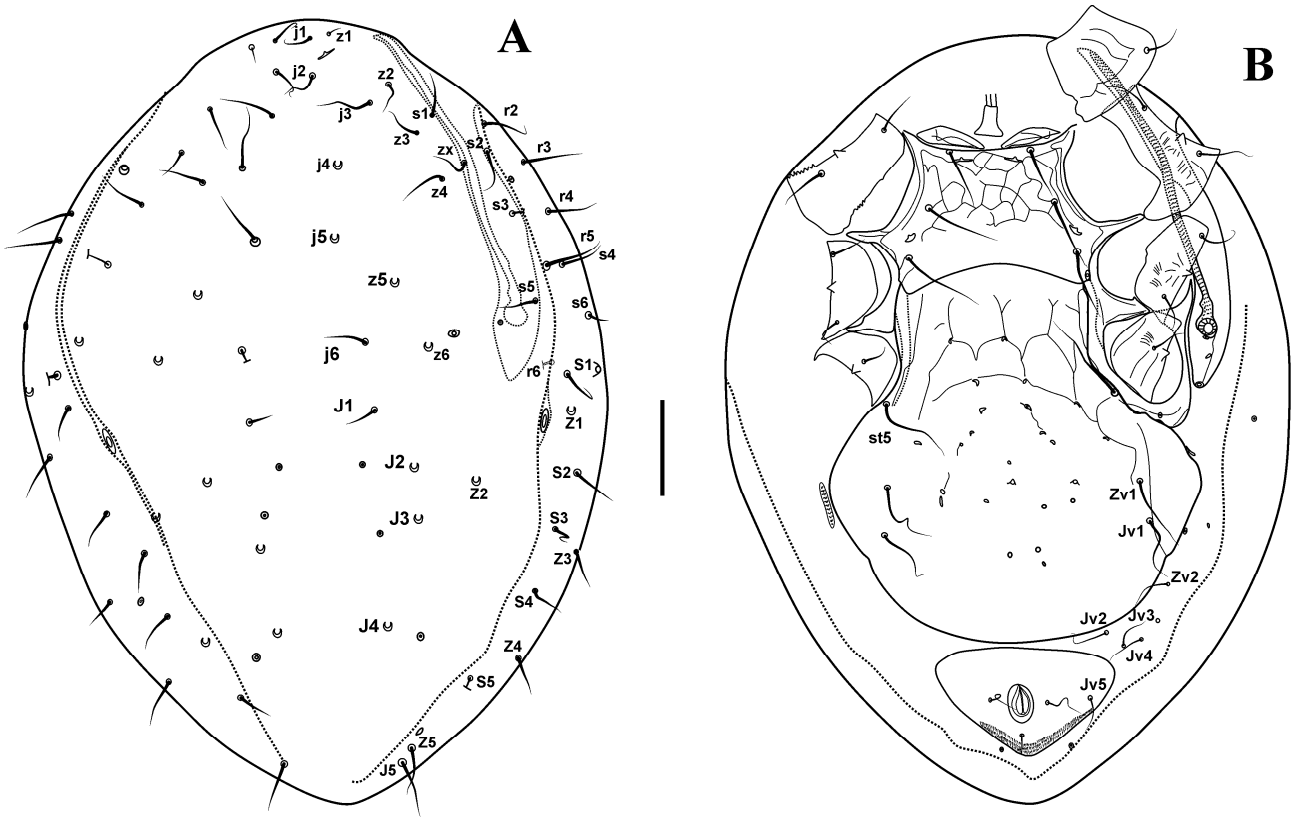

Figure 7. Holotype female of *Hypoaceus pycnosis* (Karg, 1979) – **A.** Dorsal idiosoma; **B.** Ventral idiosoma. Scale bar: 100 µm.

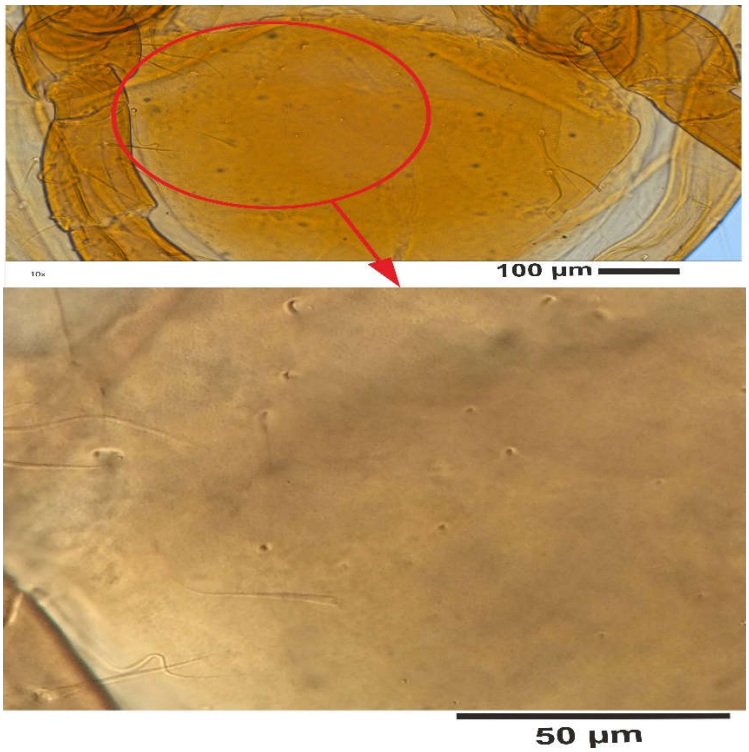

Figure 8. Holotype female of *Hypoaceus pycnosis* (Karg, 1979) – Some of pore-like structures on the genitiventral shield surface.

Genitiventral shield bearing three pairs of setae, including *st5* (85), *Zv1* (81) and *Jv1* (66), the other setae on opisthogastric area consist of *Zv2* (48) and *Jv2–5* (35–47). Paragenital pores on podal plate surface at posterior part of coxae IV, five other pore-like structures observed on opisthogastric area. Anal shield not reticulate, with semi-circular anterior margin, 103 long, 172 wide (at widest part), paranal setae (47) longer than post-anal seta (27). Cribrum with prominent spicules, extending laterally almost to level of post-anal seta. Suboval metapodal plate observed at left side of genitiventral shield. Stigmata located at area between coxae III-IV, surrounded by almost wide stigmatal plate. Peritremes wide and long, extending to middle part of coxa I, separated from exopodal shield. Poststigmatal part extending nearly from anterior part of coxa IV to its posterior level. Exopodal and endopodal plates (Fig. 9) similar to *H. eugenitalis* as explained above.

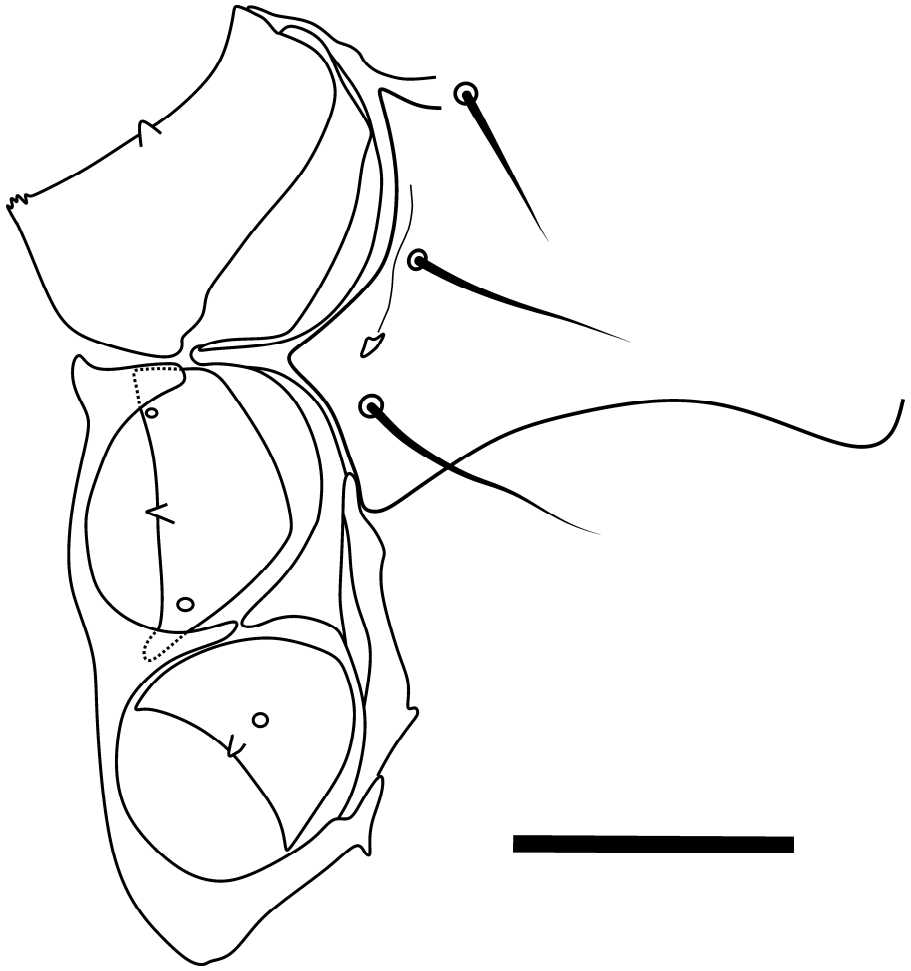

Figure 9. Holotype female of *Hypoaceus pycnosis* (Karg, 1979) – Endo- and exopodal plates. Scale bar: 100 μm.

Gnathosoma – Hypostome (Fig. 10 A) with three pairs of setae; only *h1* (48) could be observed in specimen examined (see a note under material examined). Palpcoxal setae smooth with 61 long. Deutosternal groove with six rows of 5–10 denticles, the anteriormost is smooth, first row of denticles arc medially. Corniculi normal, horn-like; internal malae consists of two toothed external appendages and two long and thread-like internal appendages. Epistome cup-like, rounded and fairly denticulate medially while smooth laterally (Fig. 10 B), with slender style underside. Labrum slender and slightly pubescent. Chelicerae (Fig. 10 C) arthrodial processes developed, moveable digit (89) with two teeth, middle article (157: from cheliceral dorsal seta to its posterior margin) ending in fixed digit (80), bearing a big tooth proximally behind setaceous pilus dentilis and three smaller teeth distally in addition to distal hook.

Palp (Fig. 10D) – Chaetotaxy normal (sensu Evans & Till 1965), with simple and thin setae, palp-tarsal claw two-tined, basal tine smaller (not in normal view in Fig. 10D probably due to preparation condition).

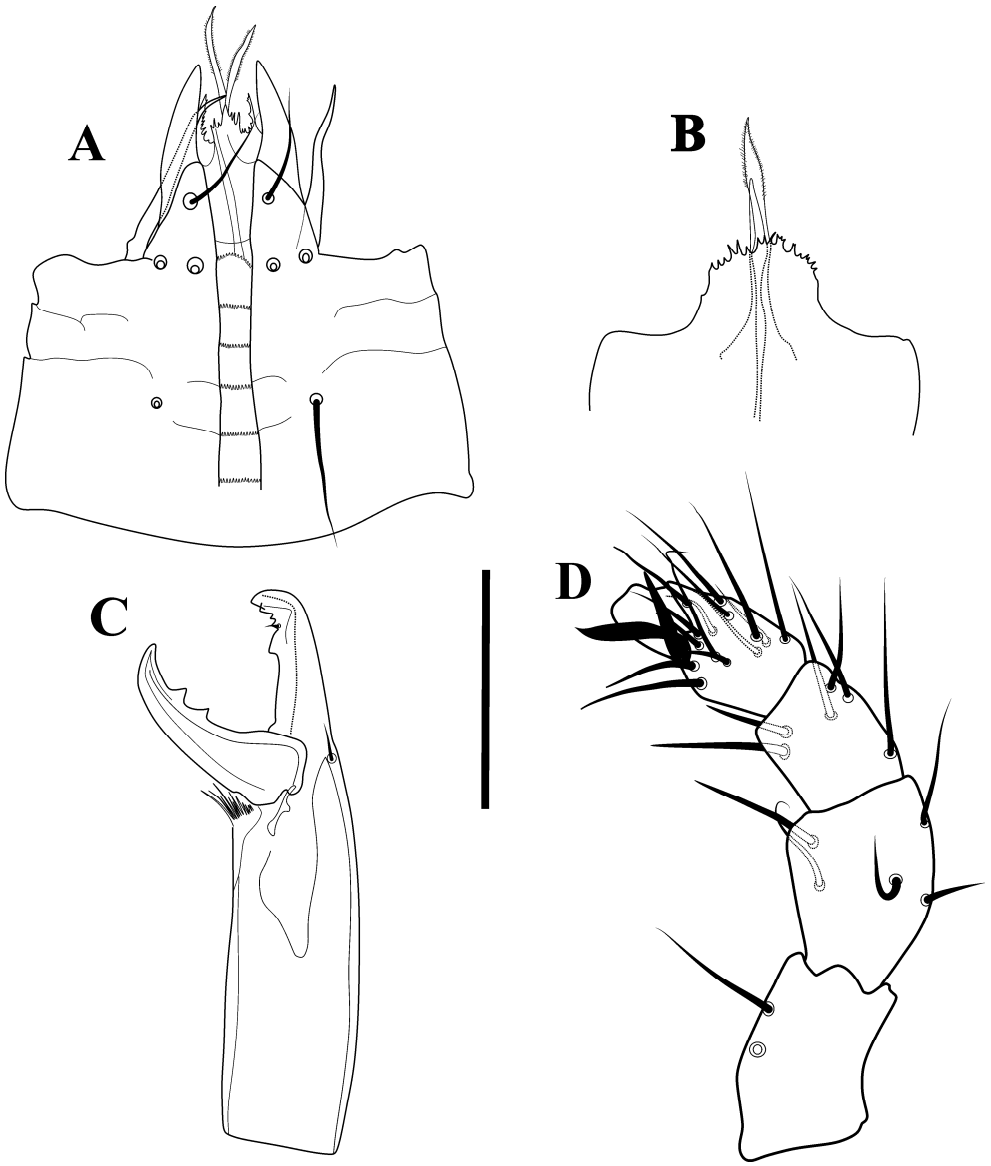

Figure 10. Holotype female of *Hypoaceus pycnosis* (Karg, 1979) – **A.** Hypostome; **B.** Epistome, labrum and supralabral process; **C.** Chelicera; **D.** Palp anterolateral view. Scale bar: 100 µm.

Legs – Tarsi I-IV with claws and ambulacra. **Leg I** 738 µm, coxa (93), trochanter (59), basi-femur (36), telo-femur (120), genu (107), tibia (118), tarsus (205 µm); **leg II** 590 µm (excluding stalk and pretarsus), coxa (44), trochanter (87), femur (114), genu (102), tibia (90), basi-tarsus (29), telo-tarsus (124); **leg III** 497 µm (excluding stalk and pretarsus), coxa (51), trochanter (78), basi-femur (40), telo-femur (60), genu (65), tibia (64), basi-tarsus (22), telo-tarsus (117); **leg IV** 646 µm (excluding stalk and pretarsus), coxa (48), trochanter (87), basi-femur (36), telo-femur (89), genu (92), tibia (75), basi-tarsus (43), telo-tarsus (176). Legs I and IV longer than legs II and III. All leg setae smooth and pointed. Legs chaetotaxy is similar to genus condition. **Leg I** (Fig. 11A); **leg II** (Fig. 11 B): tarsus (*mv* pointed and slightly thickened, *av2* and *pv2* thickened and spine-like, *av1* and *pv1* thickened and spur-like); **leg III** (Fig. 11 C): tarsus (*mv*, *av1-2*, *pv1-2* slightly thickened); **leg IV** (Fig. 11 D).

Insemination structures – Not seen.

Male

Unknown.

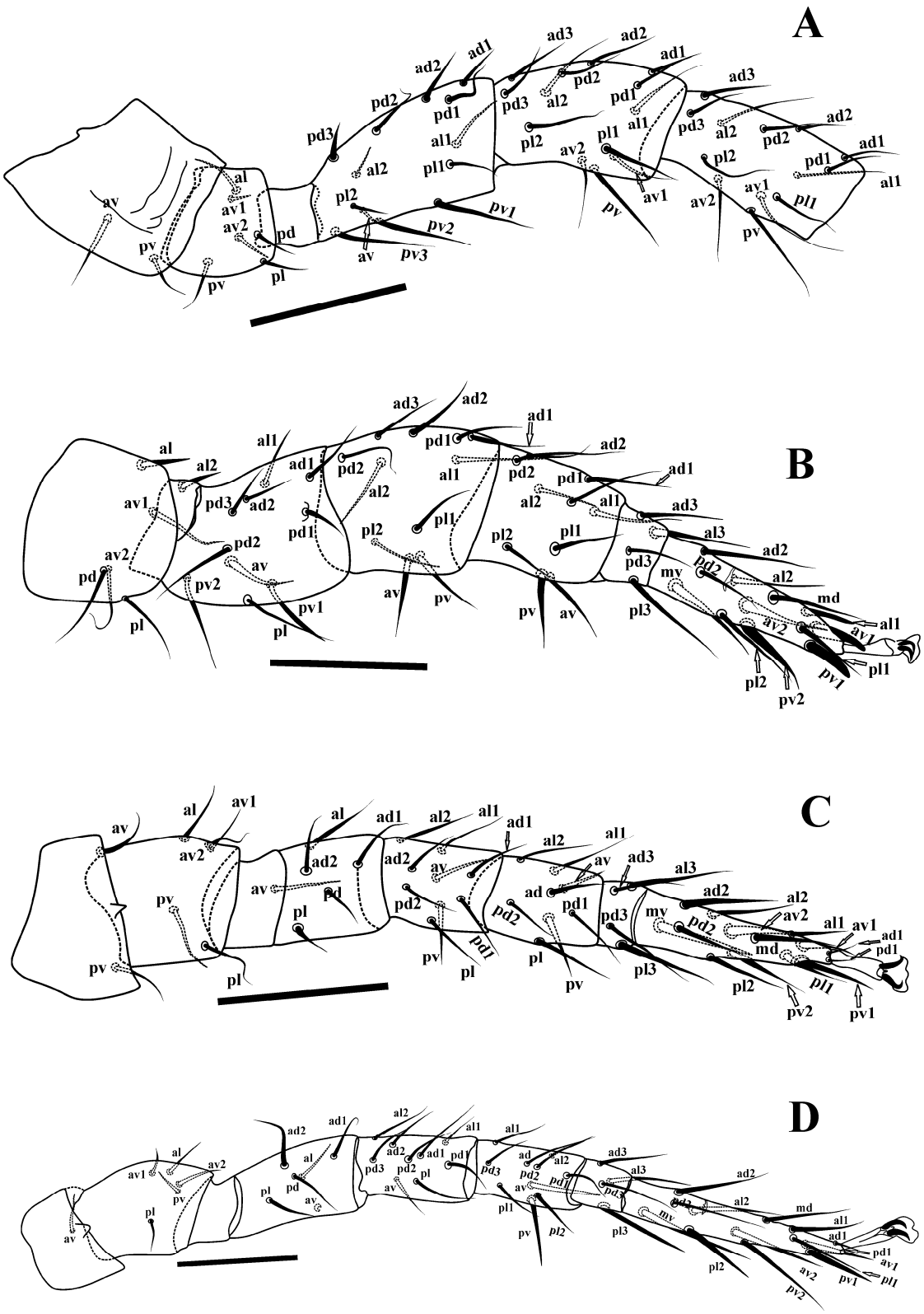

Figure 11. Holotype female of *Hypoaceus pycnosis* (Karg, 1979) – **A.** Right leg I, lateral view; **B.** Right leg II, lateral view; **C.** Right leg III, dorso-ventral view; **D.** Right leg IV, dorso-ventral view. Scale bar: 100 µm.

DISCUSSION

The new genus, *Hypoaceus* **n. gen**., has been erected to accommodate *Hypoaspis eugenitalis* and *H. pycnosis*. The former species was considered as the type for the new genus. The similarities in the main diagnostic features of both species convinced us to consider them in the same genus.

The most important diagnostic features of *Hypoaceus pycnosis* are as follows: dorsal shield with an extra pair of *zx* setae on podonotal part; the distance of *J2-J2* is about twice of *J1-J1*; setae *st4* absent; genitiventral shield well expanded posterior to coxae IV, normally bearing three pairs of setae (*Zv1* and *Jv1* well inside) including *st5* (on lateral margins of the shield), the shield bears numerous pore-like structures on the surface; hypostome with 6-7 multidentate duetosternal rows; epistome with fair denticles, supralabral process present as long style appendage; labrum narrow and pubescence; apotele two tined; tarsus II in female bearing strong spur-like setae (*av1* and *pv1*).

It is apparent from our study that the main characters of the Laelapidae family can be easily seen in the new genus; examples being the chelicerae are chelate-dentate with fair features of fixed and movable digits; the arthrodial membrane at the base of the movable digit produced into setiform processes; the cheliceral shaft is of approximately equal diameter throughout its length as in the free-living and the majority of the nest-inhabiting members of the family. There are two situations concerning the location of dorsal cheliceral seta and dorsal fissure near it. In some specimens, the dorsal seta is located above the fissure and vice versa. In *Hypoaceus* **gen. nov.**, the dorsal seta is located underside of the fissure in female and male chelicerae. Other cheliceral characters in the new genus are similar to the free-living members of the family.

Both *Hypoaceus* **gen. nov.** species have an epistome with fair denticles and supralabral process like an infrastructure long undivided style appendage. The supralabral process recently was discussed by Kazemi (2020), chiefly in *Gaeolaelaps* and some other laelapid genera.

The tarsal palpal claw (apotele) is two tined in known species of *Hypoaceus* **gen. nov.** The tines of apotele may be varied in different species of the same genus. An apotele with two or three forks may be observed among different species of the same genus. Such a situation could be seen in different species of *Gaeolaelaps*.

The absence of *st4*, one of the *Hypoaceus* **gen. nov.** characters, has been reported in other genera (e.g. *Laelaspisella*, *Pogonolaelaps*, and *Reticulolaelaps*) or laelapid species, and therefore could be considered as a plesiomorphic attribute (Costa 1968; Karg 1978; Nemati and Gwiazdowicz 2016; Joharchi *et al.* 2016; Kazemi and Beaulieu 2016). The absence of *st4* in these genera may be a result of a marked anterior expansion of the genitiventral shield, leaving too little space and little functional role for them to develop (Kazemi and Beaulieu 2016). Genitiventral shield well expanded posterior to coxae IV and bears some opisthogastric setae. It normally bears three pairs of setae in the new genus. The genital shield is more or less flask-shaped in most primitive laelapid genera such as *Gaeolaelaps* and *Hypoaspis s. str*. which is generally considered as the least specialized form. In some genera of laelapid mites, there is a general tendency for an increase in the size of the shield and the incorporation with it of several opisthogastric setae. Such a character could be seen in some genera like *Laelaspis*, *Pseudoparasitus*, *Pogonolaelaps*, and *Reticulolaelaps* and also the new genus in the present work, *Hypoaceus* **gen. nov.** that possess a big genitiventral shield. Although the expanded genitiventral shield is seen in other laelapid genera, some of them mentioned above, none of them have numerous pore-like structures. These structures were distributed on the genitiventral surface between coxae IV and in the posterior part, both in females and males. Those are of different shapes and sizes. Therefore, this attribute is restricted to the *Hypoaceus* **gen. nov.** The endopodal and exopodal plates in *Hypoaceus* **gen. nov.**, enclosing the coxal cavities II-IV similar to the nearly wide stripe which fused with enlarged podal element posterior to coxae IV as observed in other genera like *Pseudoparasitus*, *Ololaelaps*, *Laelaspulus*, and *Gymnolaelaps*. Some genera like *Hypoaspis s. s.* and *Gaeolaelaps* bearing varying degrees of reduction in the exopodal plates. In some of the obligatory parasites, only fragments of the podal shields remain, the most conspicuous being the one

behind coxa IV (Evans and Till 1966). In *Hypoaceus* **gen. nov.** endopodal plates III-IV consists of two interior and exterior plates adjacent to each other, interior one wide and nearly straight and the exterior angular behind posterolateral corners of the sternal shield, extending to mid or posterior parts of coxae IV joint with well expanded and sclerotized podal and exopodal plate which extends to the area between coxae II-III. The presence of such a structure was revealed by observations made on some specimens of *Persicolaelaps* Kazemi and Beaulieu, 2016 and *Laelaspis* (some members of *L. kamalii* Joharchi *et al.*, 2012). This structure was observed in some members of *L. kamalii*, having some differences with the original description in Joharchi *et al.* (2012) due to the presence of morphological variations. The shape and number of metapodal plates are variable in different laelapid genera. The different situations of free plates or fusion with lateral margins of genitiventral shield could be seen in some laelapid mites (e.g. *Ololaelaps* and *Hypoaceus* **gen. nov.**). As Evans and Till (1966) stated, most of the free-living forms have small, oval, elliptical, or elongate bodies. Obligatory parasites usually have only one pair that is weakly sclerotized and difficult to discern.

The presence of spurlike setae, especially in legs II were previously observed in *Hypoaspis s. str.* members, but their male members lack strong spur-like seta on the ventral side of femur II. *Pogonolaelaps* males have spine-like seta on femur II, while females don't have spur-like setae on the apical part of tarsus II. Other differential characters have been discussed in the remark section.

Hypoaceus **gen. nov.** has an enlarged pore like structure (pustule-like in appearance) at the dorso-ventral side of the opisthonotal part near the setae *Z1*. Unfortunately, there is no comprehensive information about the status of such a structure in different mites of this family. The review of available sources shows no indication of the existence of this character in different members of this family. Observation made on the various specimens in the personal collection of the first author of this paper revealed the presence of such a structure in an undescribed species of the genus *Androlaelaps* Berlese. Examination of the location of this structure shows that this pustule-like structure is probably accompanied by enlarged *gd6* and *is1*.

ACKNOWLEDGMENTS

Special thanks are due to Dr. María L. Moraza (Department of Environmental Biology, Faculty of Science, University of Navarra) for her advice and help on information concerning some pore-like structures in the paper borrowed from her correspondence. We thank Dr. Jason A. Dunlop (Museum für Naturkude, Berlin, Germany), Dr. Roberto Nannelli, Dr. Sauro Simoni (Istituto Sperimentale per la Zoologia Agraria in Firenze, Italy), and Karin Sindemark Kronestedt (Department of Zoology, Swedish Museum of Natural History, Stockholm) for sharing the materials or sending the information for taxonomic analysis.

REFERENCES

Athias-Henriot, C. (1969) Les organes cuticulaires sensoriels et glandulaires des Gamasides. Poroïdotaxie et adénotaxie. *Bulletin de la Société Zoologique de France*, 94: 485–492.

Athias-Henriot, C. (1975) Nouvelles notes sur les Amblyseiini II. Le relevé organotaxique de la face dorsale adulte (Gamasides Protoadenique, Phytoseiidae). *Acarologia*, 17: 20–29.

Baker, E.W. & Wharton, G.W. (1952) *An Introduction to Acarology*. Macmillan Co., New York,465 pp.

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. DOI: 10.11646/zootaxa.2158.1.3

Berlese, A. (1903) Diagnosi di alcuni nuove specie di Acari italiani, mirmecofili e liberi. *Zoologischer Anzeiger*, 27: 12–28.

Berlese, A. (1923) Centuria sesta di Acari nuovi. *Redia*, 15: 237–262.
Casanueva, M.E. (1993) Phylogenetic studies of the free-living and arthropod-associated Laelapidae (Acari: Mesostigmata). *Gayana Zoologia*, 57: 21–46.
Costa, M. (1968) Little known and new litter-inhabiting laelapine mites (Acari, Mesostigmata) from Israel. *Israel Journal of Zoology*, 17: 1–30.
Evans, G.O. (1963a) Observation on the chaetotaxy of the legs in the free-living Gamasina (Acari: Mesostigmata). *Bulletin of the British Museum (Natural History), Zoology*, 10(5): 275–303.
Evans, G.O. (1963b) Some observations on the chaetotaxy of the pedipalps in the Mesostigmata (Acari). *Annals and Magazine of Natural History, (Series 13)*, 6: 513–527.
Evans, G.O. & Till, W.M. (1966) Studies on the British Dermanyssidae (Acari: Mesostigmata). Part II. Classifcation. *Bulletin of the British Museum (Natural History), Zoology*, 14: 107–370.
Freira, A.R.P. (2007) *Predatory mites of the state of São Paulo, with emphasis on Laelapidae (Acari: Mesostigmata) potentially useful for the control of soil pests*. Ph.D. thesis, Faculdade de Ciencias Agrarias e Veterinarias- Unesp, Campus de Jaboticabal, 289 pp.
Huhta, V. & Krag, W. (2010) Ten new species in genera *Hypoaspis* (s. lat.) Canestrini, 1884, *Dendrolaelaps* (s. lat.) Halbert, 1915, and *Ameroseius* Berlese, 1903 (Acar: Gamasina) from Finland. *Soil Organisms*, 82(3): 325–349.
Hunter, P.E. (1961) The genus *Laelaspis*, with description of three new species (Acarina: Laelaptidae). *Annals of the Entomological Society of America*, 54: 672–683. doi: 10.1093/aesa/54.5.672
Hunter, P.E. (1966) Some mites of the genus *Pseudoparasitus* Oudemans, 1902 (Acarina: Laelaptidae). *Journal of the Georgia Entomological Society*, 37: 289–301.
Joharchi, O., Babaeian, E. & Jalalizand, A. (2016) Review of the genus *Laelaspisella* Marais & Loots, with the description of a new species from Iran (Acari, Laelapidae). *Zookeys*, 549: 13-22. DOI: 10.3897/zookeys.549.6939
Joharchi, O., Halliday, B. & Saboori, A. (2012) Three new species of *Laelaspis* Berlese from Iran (Acari: Laelapidae), with a review of the species occurring in the Western Palaearctic Region. *Journal of Natural History*, 46: 1999–2018. DOI: 10.1080/00222933.2012.707240
Joharchi, O., Halliday, B., Tolstikov, A.V. & Trach, V.A. (2019) New records and new species of mites from Cuba, with description of a new genus of Laelapidae (Acari: Mesostigmata). *Zootaxa*, 4612(3): 326–350. DOI: 10.11646/zootaxa.4612.3.2
Karg, W. (1978) Zur kenntnis der Mibengattungen *Hypoaspis*, *Androlaelaps* und *Reticulolaelaps* (Acarina: Parasitiformes, Dermanyssidae). *Zoologische Jahrbücher Abteilung für Systematik Ökologie und Geographie der Tiere*, 105: 1–32.
Karg, W. (1979) Die Gattung *Hypoaspis* Can., 1884 (Acarina: Parasitifrmes). *Zoologisches Jahrbuch der Systematik*, 106: 65–104.
Karg, W. (1981) Zur Kenntnis der Raubmilbengattung *Pseudoparasitus* Oudemans, 1902. *Deutsche Entomologische Zeitschrift*, 28: 209–220. DOI: 10.1002/mmnd.19810280402
Karg, W. (1982) Zur Kenntnis der Raubmilbengattung *Hypoaspis* Canestrini, 1884 (Acarina, Parasitiformes). *Mitteilungen aus dem Zoologischen Museum in Berlin*, 58: 233–256.
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.
Kazemi, S. (2015) A new species of *Laelaspis* Berlese (Acari: Mesostigmata: Laelapidae) from Iran, with a revised generic concept and notes on significant morphological attributes in the genus. *Zootaxa*, 4044(3): 411–428.

DOI: 10.11646/zootaxa.4044.3.5

Kazemi, S. (2020) A new species of *Gaeolaelaps* Evans and Till (Mesostigmata: Laelapidae) from mangrove forests in the Persian Gulf, and notes on gnathosomal structures of the genus and other laelapid genera. *International Journal of Acarology*, 46(3): 130–139.
DOI: 10.1080/01647954.2020.1737223

Kazemi, S. & Beaulieu, F. (2016) A new genus and species of Laelapidae (Acari: Mesostigmata) from Iran. *Zootaxa*, 4200(4): 487–500.

DOI: 10.11646/zootaxa.4200.4.2

Krantz, G.W. (1998) A new genus and two new species of hypoaspidine mites (Acari: Laelapidae) associated with Old World carpenter bees of the tribe Xylocopini (Hymenoptera: Apidae: *Xylocopa*). *International Journal of Acarology*, 24: 291–300.
DOI: 10.1080/01647959808683595

Krantz, G.W. & Ainscough, B.D. (1990) Acarina: Mesostigmata (Gamasida). *In*: Dindal, D.L. (Ed.), *Soil Biology Guide*. New York, Wiley & Sons, pp. 583–631.

Lindquist, E.E. & Evans, G.O. (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

Lindquist, E.E., Krantz, G.W. & Walter, D.E. (2009) Order Mesostigmata. *In*: Krantz, G.W. & Walter, D.E. (Eds.), *A Manual of Acarology*. Texas Tech University Press, Texas, USA, pp. 124–232.

Krantz, G.W. & Walter, D.E. (2009) Order Mesostigmata. *In*: Krantz, G.W. & Walter, D.E. (Eds.), *A Manual and Acarology*. Third edition. Texas Tech University Press, Lubbock, pp. 124–232.

Marais, J.F. & Loots, G.C. (1969) *Laelaspisella*, a new dermanyssid genus (Acari: Mesostigmata) from the Ethiopian Region. *Wetenskaplike Bydraes van die P.U. vir C.H.O., Reeks B, Natuurwetenskappe*, 4: 1–10.

Moraza, M.L. (2019) A new species of *Reticulolaelaps* Costa (Mesostigmata: Laelapidae) from the Iberian Peninsula, with a key to world species. *Acarologia*, 59(3): 374–382.
DOI: 10.24349/acarologia/20194338

Moraza, M.L. & Lindquist, E.E. (2018) A new species-group with new species of the genus *Lasioseius* (Acari: Mesostigmata: Blattisociidae) associated with Neotropical hispine beetles in furled leaves of *Heliconia*. *Acarologia*, 58(1): 62–98.
DOI: 10.24349/acarologia/20184227

Moreira, G.F. (2014) *Taxonomic studies of Laelapidae mites (Acari: Mesostigmata: Laelapidae) and their use in combination with entomopathogenic Nematodes (Rhabditida: Steinernematidae, Heterorhabditida) to control Frankliniella occidentalis (Thysanoptera: Thripidae)*. Ph. D. thesis in Agronomia (Entomologia Agricola) at University Estadual Paulista, Campus de Jaboticaba, 521 pp.

Nemati, A. & Gwiazdowicz, D.J. (2016) A new genus and species of Laelapidae from Iran with notes on *Gymnolaelaps* Berlese and *Laelaspisella* Marais & Loots (Acari, Mesostigmata). *ZooKeys*, 549: 23–49.
DOI: 10.3897/zookeys.549.6891

Nemati, N., Khalili-Moghadam, A. & Gwiazdowicz, D.J. (2019) A review of the genus *Reticulolaelaps* Costa and redescription of *R. elsae* (Joharchi, Babaeian & Jalalizand) comb. nov. *Persian Journal of Acarology*, 8(2): 77–99.
DOI: 10.22073/pja.v8i2.43017

Oudemans, A.C. (1902) New list of Dutch Acari. Second part. *Tijdschrift voor entomologie*, 45: 1–52 + Plates 1–6.

Radovsky, F.J. & Gettinger, D. (1999) Acanthochelinae, new subfamily (Acari: Parasitiformes: Laelapidae), with redescription of *Aconthochela chilensis* Ewing and description of a new genus and species from Argentina. *International Journal of Acarology*, 25(2): 77–90. DOI: 10.1080/01647959908683619

Trägårdh, I. (1906) Neue Acariden aus Natal und Zululand. *Zoologischer Anzeiger*, 30: 870–877.

Van Aswegen, P.I.M. & Loots, G.C. (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.

Womersley, H. (1955) The Acarina fauna of mutton birds' nests on a Bass Strait island. *Australian Journal of Zoology*, 3: 412–438.

جنسی جدید از کنه‌های خانوادهٔ Laelapidae (Acari: Mesostigmata) از آمریکای جنوبی

علیرضا نعمتی[۱و۲*]، داریوش جی. گویازدویچ[۳] و الهام ریاحی[۱]

۱. گروه گیاهپزشکی، دانشکدهٔ کشاورزی، دانشگاه شهرکرد، ایران؛ رایانامه‌ها: alireza.nemat@ymail.com plant.pro2@gmail.com

۲. پژوهشکده زیست فناوری دانشگاه شهرکرد، شهرکرد، ایران.

۳. دانشگاه علوم زیستی پوزنان، دانشکدهٔ جنگلداری و فناوری چوب، وجسکا پولسکیگو 71C، ۶۲۵-۶۰ پوزنان، لهستان؛ رایانامه: dagwiazd@up.poznan.pl

* نویسندهٔ مسئول

چکیده

جنس ***Hypoaceus* gen. nov.** به عنوان جنسی جدید از کنه‌های خانوادهٔ Laelapidae Berlese معرفی و توصیف می‌شود تا گونه‌های *Hypoaceus eugenitalis* (Karg) **comb. nov.** و *Hypoaceus pycnosis* (Karg) **comb. nov.** که از شیلی و آرژانتین جمع‌آوری شده‌اند را در خود جای دهد. ویژگی‌های مهم ریخت‌شناختی گونه‌های یاد شده در بالا بر اساس گونه‌های اصلی (تایپ) ارایه و بازتوصیف می‌شوند. برخی از ویژگی‌های مهم ریخت‌شناختی جنس جدید به شرح زیرند: بدون موی *st4*، صفحه جنسی-شکمی که پس از پیش‌ران پاهای چهارم به خوبی گسترده شده روی سطح خود دارای دو-سه جفت مو از جمله *st5* و تعداد زیادی ساختارهای منفذ مانند است. پیوست‌های داخلی اینترنال مالا دراز و به طور پراکنده مویچه‌دار است. اپیستوم در حاشیه جلویی دارای دندانه‌های مشخص است. پیوست‌های بالایی میله مانند و بلند، درازای اندام انتقال اسپرم حدود دو برابر بلندی انگشت متحرک کلیسر، آپوتل دو شاخه، سطح صفحه یکپارچه شکمی نر تعداد زیادی ساختار منفذ مانند دارد. پنجهٔ پاهای دوم در نر و ماده دارای موهای قطور پخ یا نوک تیز (نخستین موی جلویی-شکمی و نخستین موی عقبی-شکمی)، کنهٔ نر دارای موی خیلی قطور و پخ روی سطح شکمی ران پای دوم است (نخستین موی عقبی-شکمی).

واژگان کلیدی: *Alloparasitus*؛ کتوتاکسی؛ Dermanyssiae؛ *Hypoaspis*؛ آرایه‌شناسی.

اطلاعات مقاله: تاریخ دریافت: ۱۳۹۹/۶/۲۲، تاریخ پذیرش: ۱۳۹۹/۱۰/۹، تاریخ چاپ: ۱۴۰۰/۱/۲۶