Acarina 30 (1): 79–88

A NEW SPECIES OF *OROLAELAPS* DE LEON (ACARI: MESOSTIGMATA: MELICHARIDAE) FROM CUBA

Omid Joharchi* and Andrei V. Tolstikov

X-BIO Institute, Tyumen State University, Tyumen, Russia
*corresponding author; e-mail: o.dzhokharchi@utmn.ru

ABSTRACT: A new melicharid mite of the genus *Orolaelaps* De Leon, 1963, *O. guanahacabibensis* sp.n., is described based on female specimens collected from coastal soil litter in Cuba. The genus *Orolaelaps* is reported for the first time from Cuba. A dichotomous key for the identification of females of the world species classified in the genus *Orolaelaps* is provided.

KEY WORDS: Parasitiformes, Gamasina, Monogynaspida, Ascoidea, first record, taxonomy, Neotropical realm.

DOI: 10.21684/0132-8077-2022-30-1-79-88

INTRODUCTION

The mite family Melicharidae includes 14 genera and over 220 described species (Santos *et al*. 2022), most of which are predators. Melicharids can be found in a wide range of habitats, such as: litter; various soil substrates; nests of birds, mammals, and bumble bees; decomposing wood; beetle galleries under bark; and stored food (Westerboer 1963; Bregetova 1977; Karg 1993; Gwiazdowicz 2007; Trach *et al.*, 2019; Joharchi *et al*. 2021a; Joharchi *et al*. 2021b; Mašán *et al*. 2021). Taxonomic concepts of the Melicharidae have undergone considerable transformations over the last century. The taxon has been summarized up to the mid 1960s by Lindquist and Evans (1965), by which point it had been classified as a subfamily or a tribe (Hirschmann 1962; Lindquist and Evans 1965). However, it is now considered to be a separate family based on a uniquely shared modification of the cheliceral pilus dentilis (Lindquist *et al*. 2009). We have previously described a new genus and reported several species of this family from Russia (Trach *et al*. 2019; Joharchi *et al*. 2021a; Joharchi *et al*. 2021b; Mašán *et al*. 2021). We believe our understanding of the family and its genera will be improved by the documentation of the fauna from the geographic areas that have previously been neglected. Cuba is one such area. Before the present study, only six melicharid species belonging to two genera had been reported from Cuba (Torre Santana and Cuervo Pineda 2019): one species of the genus *Tropicoseius* Baker and Yunker and five species of the genus *Proctolaelaps* Berlese. The genus *Orolaelaps* De Leon, 1963 comprises three nominal species, which have been recorded only from the USA and Brazil, where they have been found on decaying fruits (Sourassou *et al*. 2015; Moraes *et al*. 2016). Herein, we describe the fourth species of the above genus on the basis of female specimens collected from coastal soil-litter, thereby expanding its geographical range to include Cuba. Moreover, we provide a dichotomous key for the identification of females of the species classified in the genus *Orolaelaps* De Leon, 1963.

MATERIALS AND METHODS

Mites were extracted from soil-litter samples using Berlese-Tullgren funnels. Mites were cleared in lactic acid solution and mounted in Hoyer's medium (Walter and Krantz 2009). The line drawings and examinations of the specimens were performed with the Zeiss Axio Imager A2 and Leica DM 2500 compound microscopes, equipped with drawing tubes and differential interference contrast and phase contrast optical systems, attached to cameras AxioCam ICc 5 and ICC50 HD, respectively. Most images were captured in stacks (with the focal depth manually controlled). Selected images were combined using Helicon Focus 7.6.4 Pro (Helicon Soft Ltd., 2000). Digital drawings were prepared using the Adobe Photoshop CS2 software based on the original pencil line drawings. Images and morphological measurements were taken via ZEN 2012 software (v. 8.0) and Leica Application Suite (LAS) software (v. 4.2, Live and Interactive Measurements modules). Photomicrographs were taken with an AxioCam 506 camera (Carl Zeiss, Germany).

Measurements of structures are expressed as ranges (minimum–maximum) in micrometres (μm). The length and width of the dorsal shield were taken from the anterior to the posterior margins along the midline, and at the level of *r3*, respectively. For the sternal shield, its maximum length was used, and the width was measured at the broadest point (at the level of endopodal shield between coxae II and III). The length of the genital shield was measured along the midline from the anterior margin of the hyaline extension to the posterior margin of the shield. The maximum width of the genital shield was used, posteriorly to genital setae *st5*. The length of the second cheliceral segment was measured from its base to the apex of the fixed digit. Leg length was measured from the base of the coxa to the apex of the tarsus (excluding pre-tarsus). The morphological terminology generally follows Evans and Till (1979). Dorsal and ventral setae were labeled according to the systems of Lindquist and Evans (1965) and Lindquist (1994). Palpal and leg chaetotaxy follows Evans (1963a, 1963b). Notations for idiosomal pore-like structures (gland pores and poroids/lyrifissures) and peritrematal shield follow mostly Athias-Henriot (1971, 1975). The notations for pore-like structures on the sternal shield and the peritrematal shield region follow modifications and additions by Johnston and Moraza (1991) and Makarova (2003) for gland pore *gvb*. The holotype and the paratypes are deposited in the Acarological Collection of the Tyumen State University Museum of Zoology, Tyumen, Russia (TUMZ).

SYSTEMATICS

Family **Melicharidae Hirschmann**

Orolaelaps De Leon

Genus ***Orolaelaps* De Leon, 1963: 201**

Type species: *Orolaelaps quisqualis* De Leon, 1963, by original designation

Diagnosis. The concept of *Orolaelaps* used here is based on that of Moraes *et al.* (2016).

Orolaelaps guanahacabibensis sp.n.

(Figs. 1–5)

Diagnosis (adult female). Dorsal shield with distinct reticulate ornamentation over whole surface, with 31 pairs of spine-shaped setae (21 pairs of podonotal setae and 10 pairs of opisthonotal setae), all simple and mostly reaching base of next posterior setae; sternal shield harshly reticulated, except posterior area where overlapped by hyaline flap of genital shield, some polygonal cells seemingly scalloped, with three pairs of strongly thickened and spine-like setae, with short and sharp tips; posterior margin of genital shield slightly rounded; anal shield subquadrate, anus large, located mainly in anterior half of shield; hypostomal groove with seven rows of 5–12 denticles each, rows 1–6 connected by lateral lines, rows 6th and 7th extend beyond lateral lines, corniculi with paraxial process near base; fixed cheliceral digit with six teeth in addition to apical tooth, with a barely discernible membranous lobe instead of a setiform pilus dentilis; leg chaetotaxy formulae normal for genus.

Description. *Female* (n=2).

Dorsal idiosoma (Figs. 1A, 2A). Dorsal shield 255–260 long, 148–156 wide, covering most of dorsal idiosoma; shield distinctly reticulate, more distinct in the lateral and opisthonotal sections (Figs. 1A, 2A), with 31 pairs of setae: 21 pairs of podonotal setae (18–25) (*j1–j6*, *z3–z6*, *s1–s6* and *r2–r6*) and 10 pairs of opisthonotal setae (25–30) (*J2, J5, Z1–Z5, S2–S4*), anterior end of dorsal shield barely deflexed, concealing the bases of *j1* (Figs. 1A, 2A). All setae smooth, spine-shaped, lengths of setae slightly increasing from anterior to posterior, most rather long except shortest *J5* (3–5) and longest *Z5* (35–37). Shield with about 17 pairs of discernible pore-like structures, including 13 poroids (*id1, id4, id5, idm1-idm6, idl1, idl3, idl4*) and four gland openings (*gd1, gd4, gd5*, *gd8*), others indistinct, see Figures 1A and 2A.

Ventral idiosoma (Figs. 1B, 2B, 4A–C). Tritosternum with trapezoidal base and paired pilose laciniae (35–40), fused basally (15–18), columnar base 5–7 × 4–8 wide (Figs. 1B, 2B, 4C); presternal platelets merged to sternal shield. Sternal shield length 80–84, maximum width 94–100, narrowest between coxae II (69–74), with distinct reticulate ornamentation over whole surface, except posterior area where overlapped by hyaline flap of genital shield, some polygonal cells seemingly scalloped (Figs. 1B, 2B, 4A), posterior margin slightly concave but anterior margin undulating, bearing three pairs of strongly thickened and spine-like setae, with short and sharp tips, subequal in length (13–16) (Figs. 1B, 2B, 4A), never reaching base of next setae, shield with two pairs of slit-shaped pore-like structures (*iv1* adjacent to setae *st1*; *iv2* between *st2* and *st3*) (Figs. 1B, 2B, 4A). Metasternal setae *st4* (19–21) and metasternal poroids located on small metasternal platelets (Figs. 1B, 2B, 4A). Endopodal platelets between coxae I/II (bearing gland pores *gvb*) and II/III completely fused to sternal shield, endopodal platelets III/IV elongate

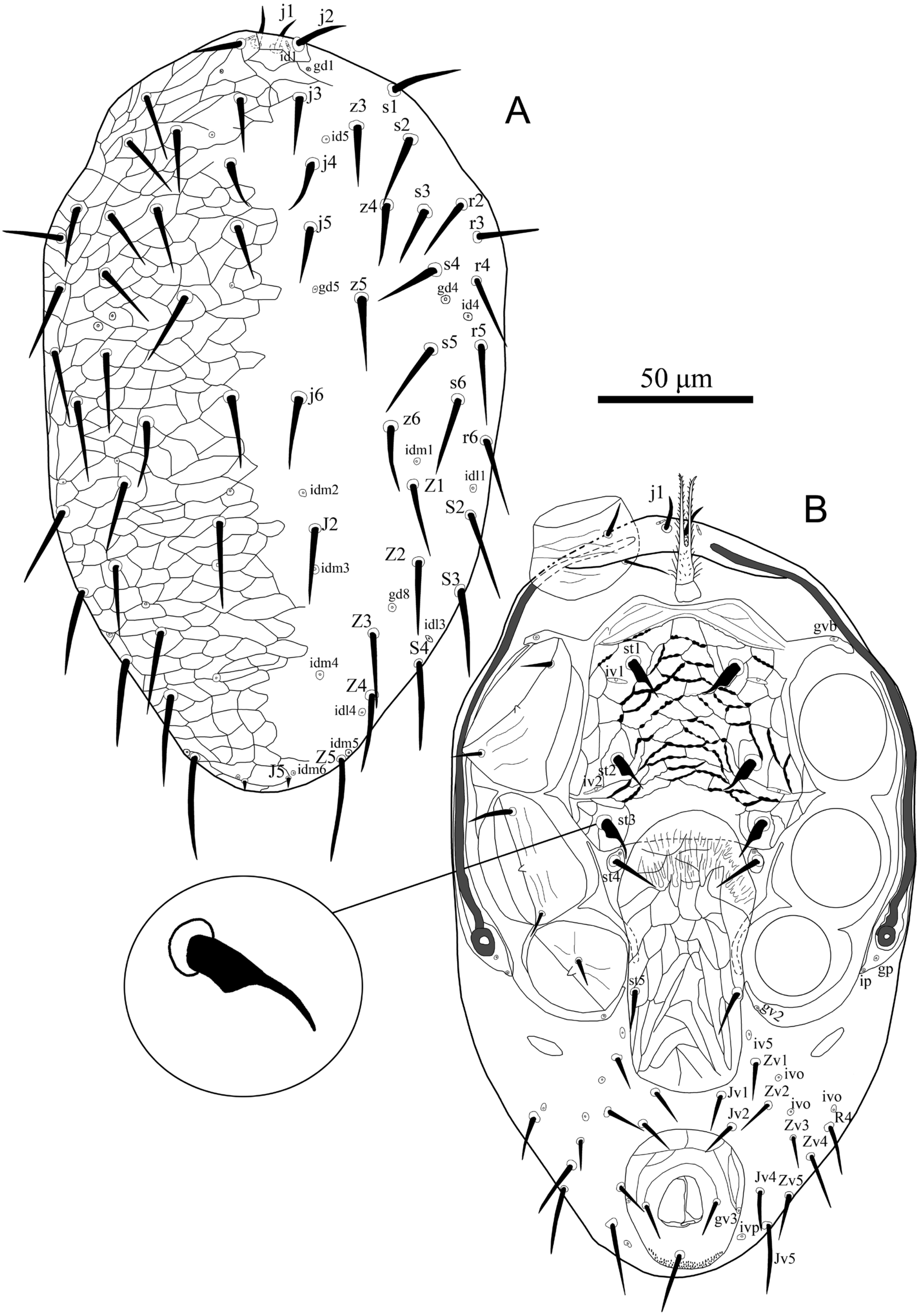

Fig. 1. *Orolaelaps guanahacabibensis* sp. n., female. A—dorsal idiosoma; B—ventral idiosoma, enlarged section not to scale.

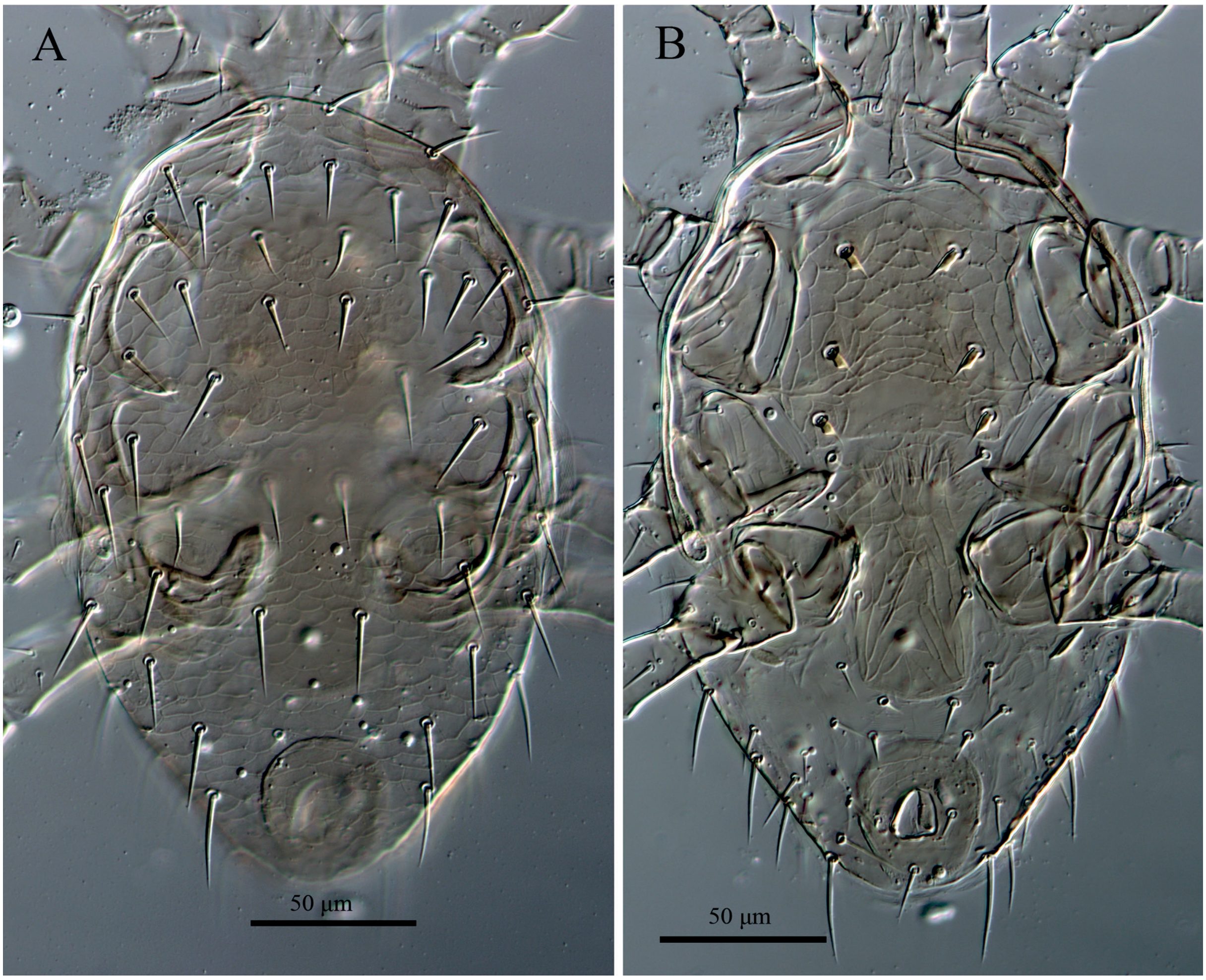

Fig. 2. DIC micrographs of *Orolaelaps guanahacabibensis* sp.n., female. A—dorsal idiosoma; B—ventral idiosoma.

and curved, partly overlapped by anterior margin of genital shield (Figs. 1B, 2B, 4B). Genital shield subrectangular, length 94–98, width at broadest level 39–41, overlapping posterior margin of sternal shield, extending to level of setae *st3*, posterior margin of genital shield slightly rounded, surface well reticulated with irregular, mostly longitudinal cells; poroids *iv5* inserted on soft cuticle laterad genital shield at posterior level of parapodal platelets behind coxa IV; postgenital platelets absent (Figs. 1B, 2B, 4B). Anal shield subquadrate (48–53 long × 39–42 wide), anterior margin slightly rounded, anterior half lineate-reticulate, anus large, located mainly in anterior region of shield, anal opening 15–18 × 14–16 wide; post-anal seta (20–23) longer and thicker than para-anal setae (13–15), cribrum wide, consisting of a terminal tuft with 3–4 irregular rows of spicules, reaching posterolateral corners of shield, limited to region posterior to post-anal seta, gland pores *gv3* on lateral margins of shield slightly posteriad para-anal setae level. Soft opisthogastric cuticle with a pair of narrowly oval metapodal platelets (13–15 long × 6–8 wide), ten pairs of smooth setae (13–20) (*Jv1*–*Jv2*, *Jv4*–*Jv5, Zv1*–*Zv5* and R4), and five pairs of poroids (*iv5,* three pairs of *ivo*; *ivp*) (Figs. 1B, 2B). Peritrematal shield narrow and fused with dorsal shield at level of setae *s1*; with two pairs of distinguishable pore-like structures (poroids *ip3* and gland pores *gp3*); peritreme extending anteriorly to level of setae *j2*. Exopodal platelets of coxae II–III, coxae III–IV and platelet enveloping coxa IV posteriorly fused into a single strip, bearing gland pores *gv2* at posteromedial extremity (Figs. 1B, 2B). Spermathecal apparatus not distinguishable.

Gnathosoma (Figs. 3A–C and 4D–G). Epistome triramous, with medial smooth tine, longer than lateral tines, these serrated along their outer margins (3B, 4E). Corniculi robust and horn-like, with paraxial process near base, smooth internal malae obviously shorter than corniculi; salivary stylets narrow, apically blunt, longer than cor-

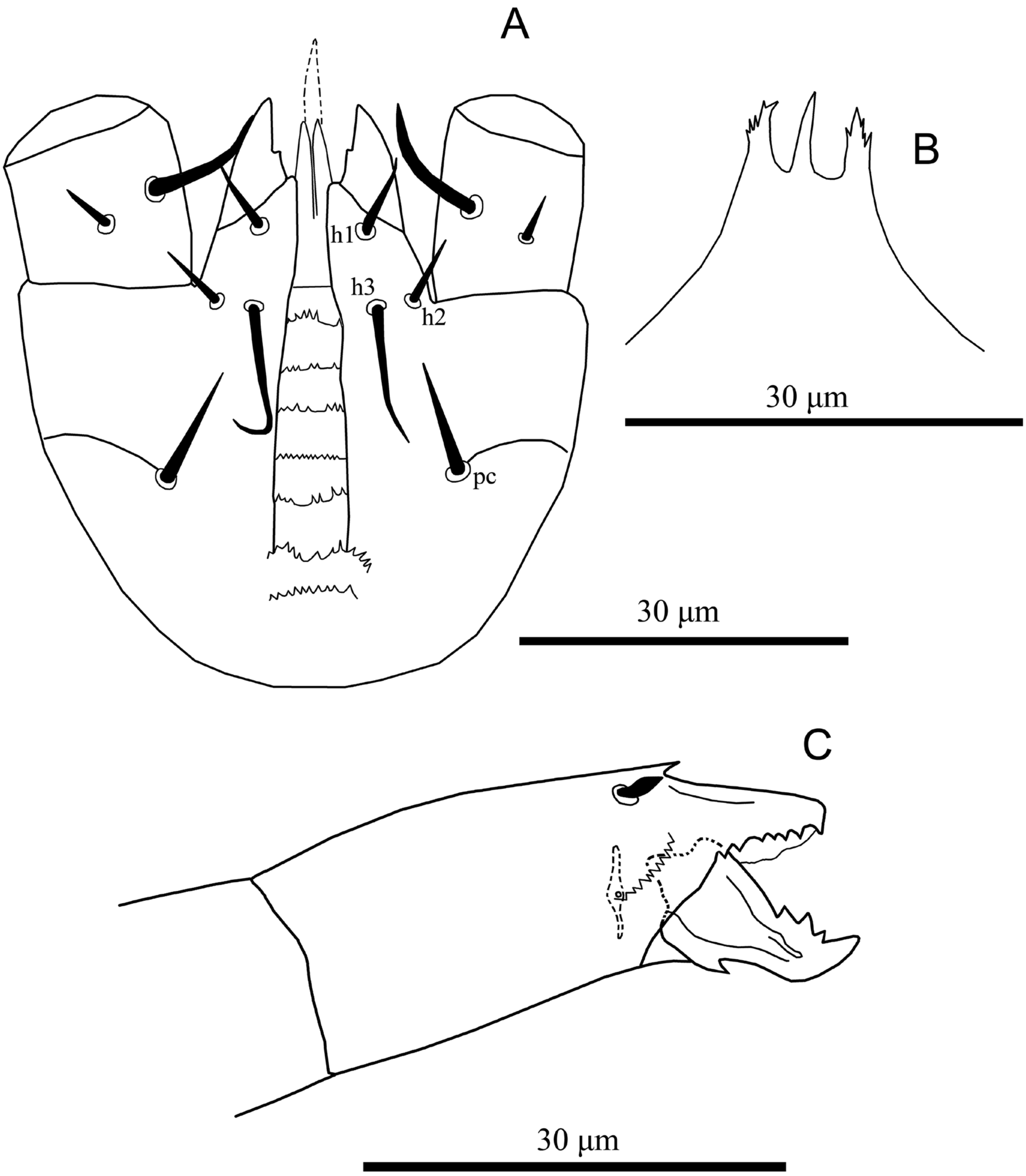

Fig. 3. *Orolaelaps guanahacabibensis* sp. n., female. A—subcapitulum; B—epistome; C—chelicera.

niculi; hypostomal and capitular setae smooth, *h3* (15–18) > *pc* (9–11) > *h1* (8–10) > *h2* (7–9); hypostomal groove with seven rows of 5–12 denticles each, rows 1–6 connected by lateral lines, 5th row slightly concave medially, 6th and 7th rows extend beyond lateral lines (3A, 4D), supralabral process not distinguishable. Chaetotaxy of palps: 2–5–6–15–16; palpfemoral seta *al* and palpgenual setae *al1* and *al2* bacilliform flattened apically and spatulate, respectively, other setae simple, palptarsal claw two-tined (Fig. 4F). Cheliceral dorsal and antiaxial lyrifissures distinct; hyaline rim on paraxial surface of fixed digit with 10–12 denticles. Second cheliceral segment length (41–45), movable digit length (16–19).

Fixed digit of chelicera with acicular dorsal mucro near short and thick dorsal seta, fixed cheliceral digit with six similar small teeth in addition to apical hook, pilus dentilis absent, a barely discernible membranous lobe present; movable digit with three teeth in addition to apical hook and sharp proximal mucro ventrally (Figs. 3C, 4G).

Legs (Fig. 5). Legs II (173–177) and III (162–168) short, legs I (222–230) and IV (213–219)

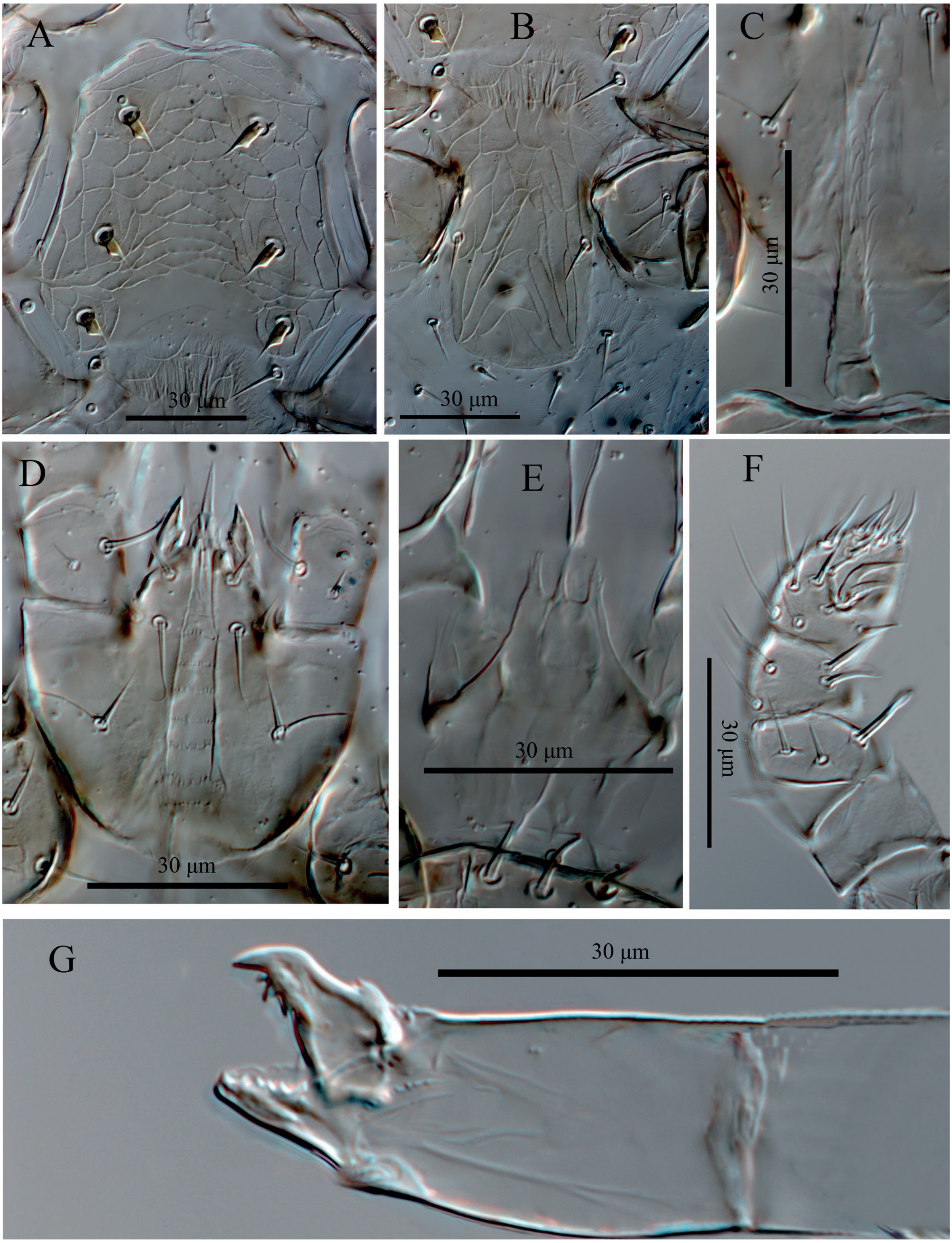

Fig. 4. DIC micrographs of *Orolaelaps guanahacabibensis* sp. n., female. A—sternal shield; B—genital shield; C—Tritosternum; D—subcapitulum; E— epistome; F—distal portion of palp, with a focus on apotele; G—chelicera.

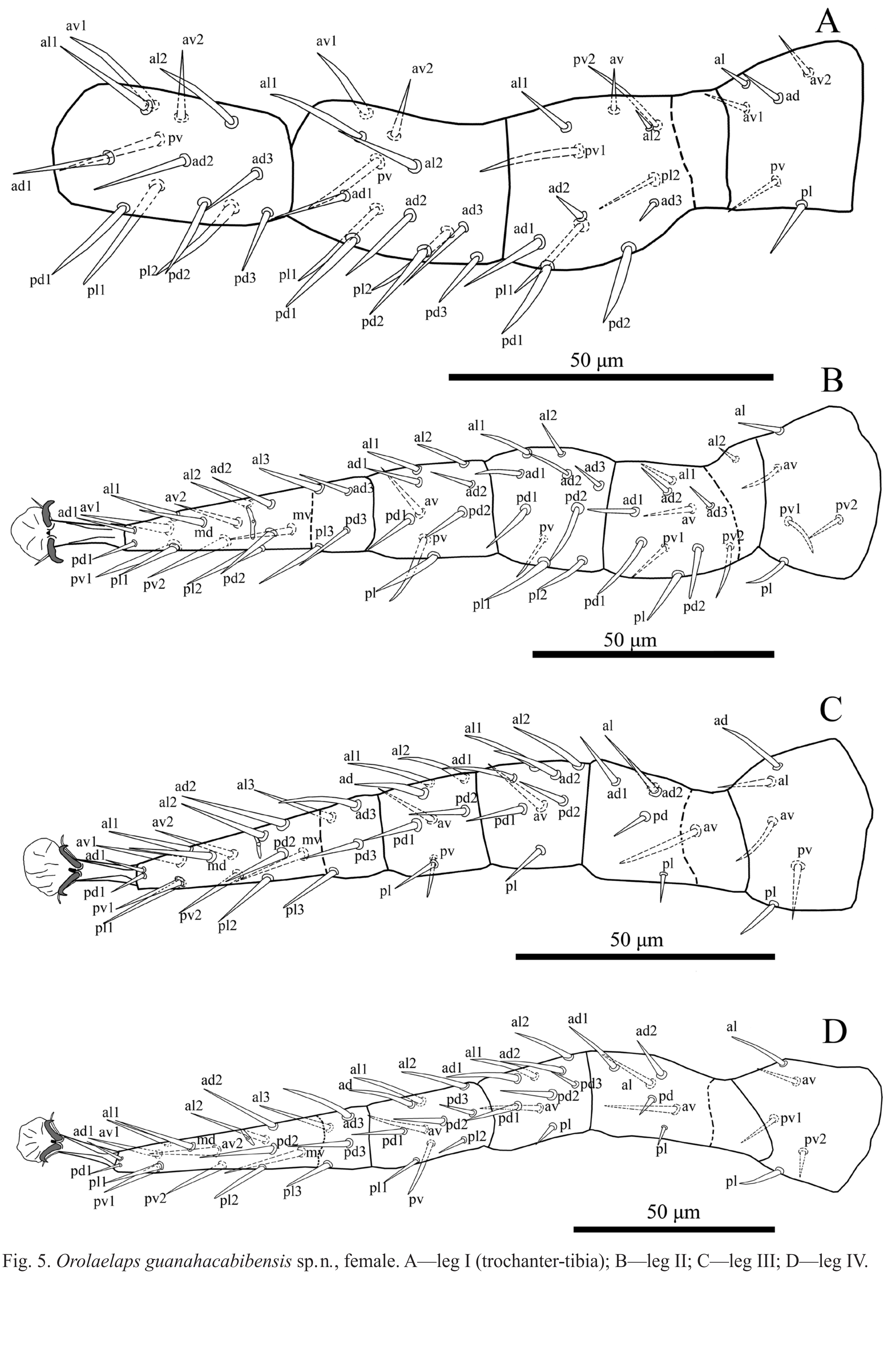

Fig. 5. *Orolaelaps guanahacabibensis* sp. n., female. A—leg I (trochanter-tibia); B—leg II; C—leg III; D—leg IV.

longer. Setation of legs I–IV, coxae 2–2–2–1; trochanters 6–5–5–5; femora 12–11–6–6; genua 13–10–8–9; tibiae 13–9–8–10. Chaetotaxy: Leg I (Fig. 5A): coxa 0–0/1, 0/1–0, trochanter 1–1/2, 0/1–1, femur 2–3/1, 2/2–2, genu 2–3/2, 3/1–2, tibia 2–3/2, 3/1–2. Leg II (Fig. 5B): coxa 0–0/1, 0/1–0, trochanter 1–0/1, 0/2–1, femur 2–3/1, 2/2–1, genu 2–3/0, 2/1–2, tibia 2–2/1, 2/1–1. Leg III (Fig. 5C): coxa 0–0/1, 0/1–0, trochanter 1–1/1, 0/1–1, femur 1–2/1, 1/0–1, genu 2–2/1, 2/0–1, tibia: 2–1/1, 2/1–1. Leg IV (Fig. 5D): coxa 0–0/1, 0/0–0, trochanter 1–0/1, 0/2–1, femur 1–2/1, 1/0–1, genu 2–2/1, 3/0–1, tibia 2–1/1, 3/1–2. Tarsi II–IV with 18 setae (3–3/2, 3/2–3 + *mv*, *md*); without macrosetae, see Fig. 5. All legs with elongate pretarsi, bearing small paired claws, short paradactyli and rounded pulvillae.

Insemination structures: Not seen, apparently unsclerotized.

*Male and immatures***.** Unknown.

Type material examined: Bahia de Corrientes, Maria la Gorda, Península de Guanahacabibes, Pinar del Rio Province, Cuba, 21°48′49″N, 84°29′57″W, 4 Jan. 2022, coll. A.V. Tolstikov from coastal soil litter; paratype one female, same data as holotype.

Etymology. The specific name is derived from the type locality.

Remarks. *Orolaelaps guanahacabibensis* can be easily distinguished from other three described congeners of the genus by the following combination of characters: (1) all dorsal shield setae spine-shaped and uniform; (2) sternal setae (*st1–st3*) strongly thickened and spine-like, with short and sharp tips (right–trapezoidal-shaped); (3) anal shield subquadrate, anus large, located mainly in anterior half of shield; (4) epistome triramous, with medial smooth tine, longer than lateral tines, these serrated along their outer margins; (5) corniculi with paraxial process near base; (6) fixed cheliceral digit with six teeth in addition to apical tooth, with a barely discernible membranous lobe instead of a setiform pilus dentilis. Nothing is known about the feeding behavior of these mites or any other aspects of their biology. According to its normal melicharid morphology (dentate chelicerae, sclerotised and horn-like corniculi, etc.), we suspect that *O. guanahacabibensis* is a predator of small invertebrates. We stress that further comprehensive field studies and experimental work are needed to find more species of this genus and establish the role of this mite in its respective ecosystems. The following key is based on published descriptions and illustrations, except for *O. guanahacabibensis*.

Key to species of *Orolaelaps* De Leon

1. Podonotal shield with at least one pair of modified setae..
O. tupiniquim Sourassou, Moraes and Santos, 2015 (Brazil)
— Podonotal shield setae uniform, without modified setae...2
2. Sternal setae *st3* strongly thickened and spine-like, with short and sharp tips (right-trapezoidal-shaped), anal opening enlarged............................
.... *O. guanahacabibensis* sp.n. (Cuba)
— Sternal setae *st3* needle-shaped, anal opening not enlarged...3
3. Fixed cheliceral digit with 9–10 teeth in addition to apical tooth, a yoke-shaped thickening extending internally across the sternal shield between *st1* and *st2* .... *O. quisqualis* De Leon, 1963 (USA)
— Fixed cheliceral digit with 6–7 teeth in addition to apical tooth, sternal shield without yoke-shaped thickening.. *O. piracicabensis* Sourassou, Moraes and Santos, 2015 (Brazil)

ACKNOWLEDGMENTS

This research was supported by the cooperative agreement No. FEWZ-2021–0004 from the Russian Ministry of Science and Higher Education. We also thank Dr. Dania Prieto (Universidad de la Habana, Cuba) for her collaboration on the studies of the mites of Cuba.

REFERENCES

Athias-Henriot, C. 1971. Mesostigmates (Urop. Excl.) edaphiques mediterraneens (Acaromorpha, Anactinotrichida) (collect. Prof. H. Franz et C. Athias-Henriot). Pemiere Serie. *Acarologia*, 3: 381–509.

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

Bregetova, N.G. 1977. [Family Laelaptidae Berlese, 1892]. In: M.S. Ghilyarov and N.G. Bregetova (Eds.). [*Key to the Soil Inhabiting Mites of the*

Mesostigmata]. Nauka, Leningrad, pp. 169–226. [In Russian]

De Leon, D. 1963. A new genus and twelve new species of mites from Mexico and Southeast United States (Acari: Blattisociidae). *The Florida Entomologist*, 46: 197–207. DOI: 10.2307/3493632

Evans, G.O. 1963a. Observations on the chaetotaxy of the legs in the free-living Gamasina (Acari: Mesostigrnata). *Bulletin of the British Museum* (*Natural History*) *Zoology*, 10: 275–303. DOI: 10.5962/bhl.part.20528

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. DOI: 10.1080/00222936308651393

Evans, G.O. and Till, W.M. 1979. Mesostigmatic mites of Britain and Ireland (Chelicerata: Acari–Parasitiformes). An introduction to their external morphology and classification. *Transactions of the Zoological Society of London*, 35: 145–270. DOI: 10.1111/j.1096-3642.1979.tb00059.x

Gwiazdowicz, D.J. 2007. *Ascid Mites (Acari, Mesostigmata) from Selected Forest Ecosystems and Microhabitats in Poland*. Wydawnictwo Akademii Rolniczej im. Augusta Cieszkowskiego, Poznan. 248 pp.

Hirschmann, W. 1962. Gangsystematik der Parasitiformes. Teil 5. Gamasiden Rückenhaarbestimmungstafeln von 260 *Typhlodromus*-Arten der Erde. Gänge, Chaetotaxie, Porotaxie, Mundwerkzeuge von *Typhlodromus* und verwandten Gattungen von *Proctolaelaps*, *Melichares*, *Lasioseius*, *Iphidozercon*, *Sejus*, *Rhodacarellus*, *Rhodacarus*, *Gamasellus*, *Veigaia*, *Macrocheles ivanovi*. Erstversuch der Aufstellung eines Gangsystems der Gamasiden aufgrund der Gnathosomaunterseite. *Acarologie. Schriftenreihe für Verglenchende Milbenkunde*, 5: 1–56.

Joharchi, O., Döker, I. and Khaustov, V.A. 2021a. Rediscovery of two gamasid mites (Acari: Mesostigmata) associated with beetles in Western Siberia, Russia. *International Journal of Acarology*, 47: 268–279. DOI: 10.1080/01647954.2019.1618914

Joharchi, O., Marchenko, I.I., Döker, I. and Khaustov, V.A. 2021b. A new species of the genus *Proctogastrolaelaps* McGraw & Farrier (Acari: Melicharidae) from the Far East of Russia, and contributions to knowledge of this genus. *Zootaxa,* 5072(4): 380–388.

Johnston, D.E. and Moraza, M.L. 1991. The idiosomal adenotaxy and poroidotaxy of Zerconidae (Mesostigmata: Zerconina). In: F. Dusbábek and V. Bukva (Eds.). *Modern Acarology*. Vol. 2. Academia, Prague, pp. 349–356.

Karg, W. 1993. *Acari (Acarina), Milben Parasitiformes (Anactinochaeta), Cohors Gamasina Leach, Raubmilben. Die Tierwelt Deutschlands und der angrenzenden Meeresteile nach ihren Merkmalen und ihrer Lebensweise, 59(2), überarbeitete Auflage.* Gustav Fischer Verlag, Jena, Stuttgart, New York. 523 pp.

Lindquist, E.E. 1994. Some observations on the chaetotaxy of the caudal body region of gamasine mites (Acari: Mesostigmata), with a modified notation for same ventrolateral body setae. *Acarologia*, 35: 323–326.

Lindquist, E.E. and 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.

Lindquist, E.E., Krantz, G.W. and Walter, D.E. 2009. Order Mesostigmata. In: G.W. Krantz and D.E. Walter (Eds.). *A Manual of Acarology*. 3rd Edition. Texas Tech University Press, Lubbock, Texas, pp. 1–807.

Makarova, O.L. 2003. A new genus and three new species of the mite family Arctacaridae (Parasitiformes, Mesostigmata) from North America. *Entomological Review*, 83: 868–886.

Mašán, P., Joharchi, O. and Abramov, V.V. 2021. A new genus and two new species of melicharid mites (Acari: Mesostigmata) associated with wood-decaying fungi and mycophagous erotylid beetles (Coleoptera: Erotylidae) in Europe. *Zootaxa*, 4980: 157–173. DOI: 10.11646/zootaxa.4980.1.10

Moraes, G.J. de, Britto, E.P.J., Mineiro, J.L. de C. and Halliday, B. 2016. Catalogue of the mite families Ascidae Voigts & Oudemans, Blattisociidae Garman and Melicharidae Hirschmann (Acari: Mesostigmata). *Zootaxa*, 4112(1): 1–299. DOI: 10.11646/zootaxa.4112.1.1

Santos, J.C., Demite, P.R. and Moraes, G.J. de. 2022. Melicharidae Database. Date of access: 17.05.2022. http://www.lea.esalq.usp.br/acari/melicharidae

Sourassou, N.F., Moraes, G.J. de and Santos, J.C. 2015. *Orolaelaps* (Acari: Mesostigmata: Melicharidae): description of two new species, redescription of

Orolaelaps quisqualis and new characterisation of the genus. *Zootaxa*, 4039(2): 312–322. DOI: 10.11646/zootaxa.4039.2.6

Torre Santana, P.E. de la and Cuervo Pineda, N. 2019. Actualización de la lista de ácaros (Arachnida: Acari) de Cuba. *Revista Ibérica de Aracnología*, 34: 102–118.

Trach, V.A., Marchenko, I.I. and Joharchi, O. 2019. Redescription of the female of bumblebee associated gamasid mite *Proctolaelaps sibiriensis* (Davydova, 1988) (Acari: Mesostigmata: Melicharidae) from North Asia. *Acarologia,* 59: 531–541. DOI: 10.24349/acarologia/20194353

Walter, D.E. and Krantz, G.W. 2009. Collecting, rearing and preparing specimens. In: G.W. Krantz and D.E. Walter (Eds.). *A Manual of Acarology.* 3rd edition. Texas Tech University Press, Lubbock, Texas, pp. 83–95.

Westerboer, I. 1963. Die Familie Podocinidae Berlese 1916. Abschnitt IV. In: H.J. Stammer (Ed.). *Beiträge zur Systematik und Ökologie mitteleuropäischer Acarina. Band II. Mesostigmata I.* Akademische Verlagsgesellschaft Geest and Portig K.-G., Leipzig, pp. 179–450.