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Article

A new species of the genus *Nidilaelaps* Shaw (Acari: Mesostigmata: Laelapidae) from Cuba

Omid Joharchi and Sergey G. Ermilov

Institute of Environmental and Agricultural Biology (X-BIO), Tyumen State University, Tyumen, Russia; E-mails: J.omid2000@gmail.com, ermilovacari@yandex.ru

ABSTRACT
We present the first record of *Nidilaelaps* Shaw in the Caribbean area on the basis of a new species, *Nidilaelaps cubaensis* **sp. nov.**, collected from forest litter in Cuba. The new species is described and illustrated based on morphological characters of the adult female and compared with closely related species.

KEYWORDS: First record, Gamasina, Monogynaspida, Neotropical realm, Parasitiformes, taxonomy.

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INTRODUCTION

The mite family Laelapidae Berlese (Acari: Parasitiformes) is one of the most diverse families in the order Mesostigmata (Moraes *et al*. 2022). The genus *Nidilaelaps* Shaw, 2012 comprises three nominal species, which have been recorded from mammals, birds, or their nests in Papua New Guinea and Australia (Womersley 1955; Evans and Till 1966; Domrow 1973; Shaw 2012). The type species of the genus, *Nidilaelaps annectans* (Womersley, 1955), is common in a variety of mammal and bird nests and also in forest litter, which have been recorded from Argentina, Papua New Guinea**,** Australia, New Zealand, Great Britain, Hawaiian Islands, Tristan Da Cunha and Nightingale Islands (Womersley 1955; Evans and Till 1966; Domrow 1973; Shaw 2012; Joharchi *et al*. 2021). Shaw (2012) suggested that *Nidilaelaps* is endemic to the Australopapua region and that the occurrence of *N. annectans* in other regions is facilitated by its numerous phoretic associations, particularly with birds and rodents. We agree with his assumption regarding the method of dispersal of the genus (i.e. phoretic associations with birds and rodents), but according to this statement, the fourth species of *Nidilaelaps*, described on the basis of female specimens collected from forest litter in Cuba, extends its geographical range to the Caribbean. The genus is thus not endemic to the Australopapua region.

MATERIALS AND METHODS

The specimens documented here originate from the collection of the Tyumen State University Museum of Zoology, Tyumen, Russia (TUMZ). The line drawings and examinations of the specimens were performed with Zeiss® Axio Imager A2 compound microscope equipped with differential interference contrast optical systems, attached to an AxioCam 506 camera (Carl Zeiss, Germany).

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Most images were captured in stacks (with focal depth manually controlled). Selected images were combined using Helicon Focus 7.6.4 Pro (Helicon Soft Ltd, 2000). Digital drawings were prepared using Adobe Photoshop CS2 software based on the original pencil line drawings. Images and morphological measurements were taken via ZEN 2012 software (version 8.0). Photomicrographs were taken with an AxioCam 506 camera (Carl Zeiss, Germany). Measurements of structures are expressed as ranges (minimum–maximum) in micrometers. The length and width of the dorsal shield were taken from the anterior to the posterior margins along the midline, and at level of *r3*, respectively. Length and width of the sternal shield were measured at the maximum length and broadest points (at level of endopodal region, between coxae II and III), respectively. 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, and its width where maximal, posterior to genital setae *st5*. Leg length was measured from the base of the coxa to the apex of the tarsus (excluding the pre-tarsus). The nomenclature used for the dorsal idiosomal chaetotaxy follows that of Lindquist and Evans (1965), the notations for leg and palp setae follow those of Evans (1963a, b), and other anatomical structures mostly follow Evans and Till (1979). 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 for the peritrematal shield region also follow modifications and additions by Johnston and Moraza (1991). The holotype and paratypes are deposited at the TUMZ.

Family Laelapidae Berlese
Genus *Nidilaelaps* Shaw, 2012

Nidilaelaps Shaw, 2012: 26.

Type species: *Gymnolaelaps annectans* Womersley 1955: 419; by original designation.

Diagnosis

The concept of *Nidilaelaps* used here is based on that of Shaw (2012) and Moraes *et al*. (2022).

Nidilaelaps cubaensis sp. nov. (Figs. 1–14)

http://zoobank.org/urn:lsid:zoobank.org:act:5F3B4E1C-DB69-4451-870B-25CC002849C

Type material

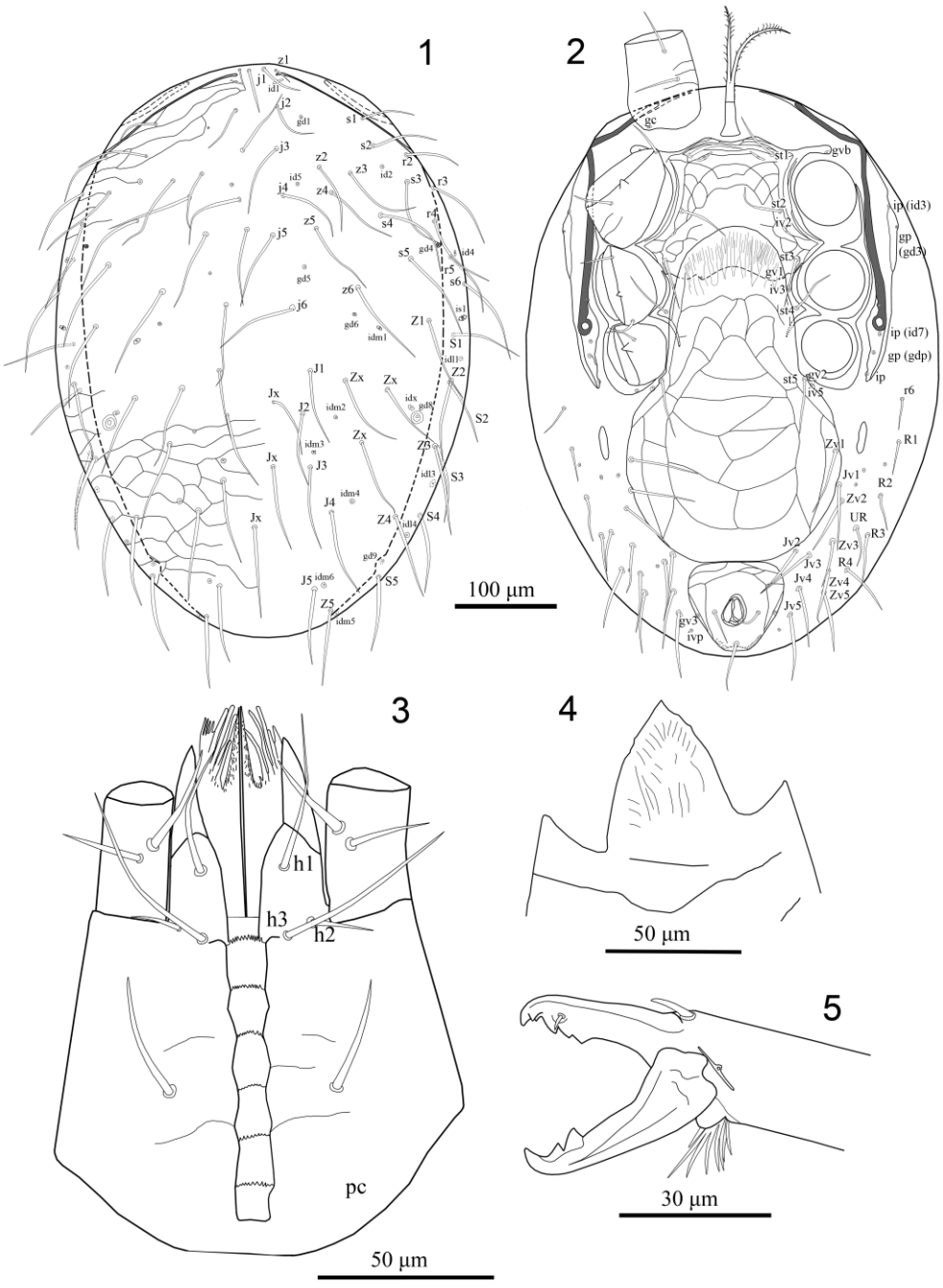
Holotype, female, Cienfuegos Province, Sierra del Escambray, El Nicho, Cuba, 22° 1′ N, 80 °7′ W, collected from forest litter (collector and date of collection unknown). Paratypes, two females, same data as holotype.

Diagnosis (adult female)

Dorsal shield covering idiosoma, suboval, slightly extending onto ventrolateral aspect of idiosoma, with 40 pairs of smooth setae (except *Z5* and *J5*, with a few barbs), including three pairs of *Zx*, and three unpaired (*Jx*) setae; dorsal setae long, reaching well past base of next posterior setae, homogeneous in length and thickness; presternal area weakly sclerotized, sternal shield with reticulate ornamentation throughout, except central and posterior parts faintly reticulated, anterior margin of shield undulating, posterior margin slightly concave; genito-ventral shield bottle-shaped, long, broadly abutting anal shield, bearing setae *st5* and *Zv1* and two additional pairs of setae (*Jv1–2*) on its margins (flanking shield), shield ornamented posteromedially by 7–9 broad transverse cells; anal shield subtriangular, subequal in length and width, post-anal seta slightly longer than para-anal setae; fixed digit of chelicera with five teeth (including an offset subapical tooth, gabelzhan); all leg setae simple, acicular, legs I and IV longer than length of idiosoma.

Description (Female, n = 3)

Dorsal idiosoma (Figs. 1, 6) – Dorsal shield 570–600 long, 420–450 wide, covering idiosoma, suboval, slightly extending onto ventrolateral aspect of idiosoma, shield with weak reticulation, more distinct in opisthonotal and lateral regions (posterior to *J1*), with 40 pairs of smooth setae (except *Z5* and *J5*, with a few barbs): 22 pairs of podonotal setae, 18 pairs of opisthonotal setae, including three pairs *Zx*, and three unpaired (*Jx*) setae. Dorsal setae long (70–95), reaching well past base of next posterior setae, homogeneous in length and thickness, except *j1* (40–43), *z1* (19–21) shortest (Figs. 1, 6). Shield with about 21 pairs of discernible pore-like structures, including 16 poroids (*id1*, *id2*, *id4-id6*, *idm-idm6*, *is1*, *idx*, *idl1*, *idl3*, *idl4*) and five gland openings (*gd1*, *gd5–6*, *gd8–9*), others indistinct.

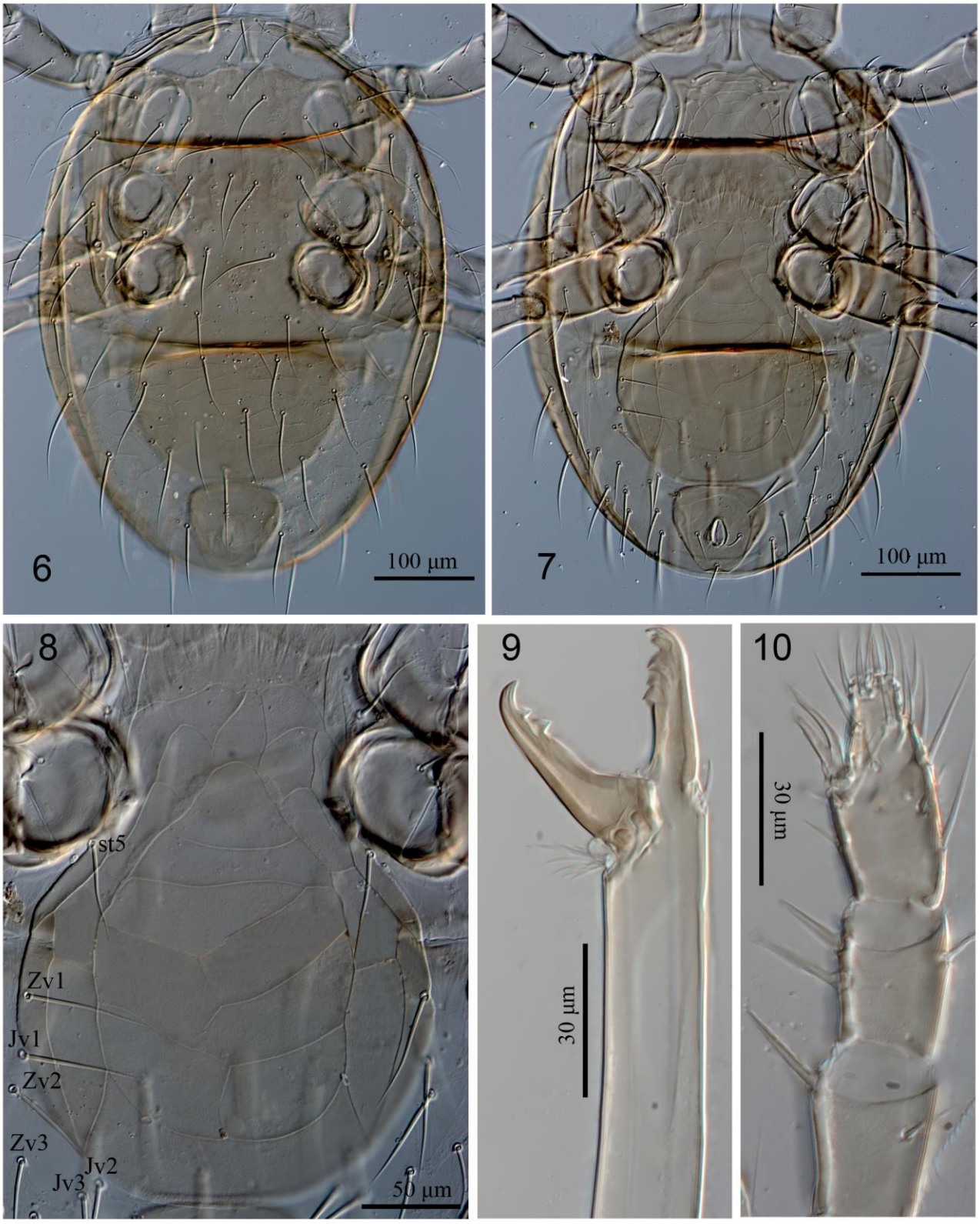


Figures 1–5. *Nidilaelaps cubaensis* **sp. nov.** (female) – 1. Dorsal idiosoma; 2. Ventral idiosoma; 3. Subcapitulum; 4. Epistome; 5. Chelicera, lateral view.

Ventral idiosoma (Figs. 2, 7, 8) – Tritosternum with paired pilose laciniae (105–108), fused basally (20–22), columnar base 33–35 × 18–20 wide; presternal area lightly sclerotized, fused to sternal shield; sternal shield length 125–130, maximum width 185–195, narrowest between coxae II (119–123), with distinct reticulate ornamentation over whole surface, except posterior area between setae *st2–st3*, where overlapped by hyaline flap of genital shield smooth or faintly reticulated (Figs. 2, 7), anterior margin of shield undulating, posterior margin slightly concave, remnants of gland pores *gv1* apparent near posterior shield margin; bearing three pairs of smooth setae (*st1–3*) (48–52), almost reaching base of next setae, and two pairs of poroids, *iv1* and *iv2* slit-like, adjacent to setae *st1* and between *st2* and *st3*, respectively. Metasternal platelets absent; metasternal setae *st4* (50–52) and metasternal poroids located on soft integument. Endopodal plates between coxae I–II (bearing gland pores *gvb*) and II–III completely fused to sternal shield, endopodal plates III/IV elongate, narrow and curved. Genito-ventral shield bottle-shaped, expanded, broadly abutting anal shield, length 330–350, maximum width 215–225, posterior margin rounded, shield ornamented posteromedially by 7–9 broad transverse cells, bearing setae *st5* (55–57) and *Zv*1 (69–72) and two additional pairs of setae (*Jv1–2*) (63–66) on its margins (flanking shield) (Figs. 2, 7, 8), paragenital poroids *iv5* located on soft cuticle lateral to shield (on its margins) near seta *st5* (Figs. 2, 7, 8). Anal shield subtriangular, subequal in length and width (length 93–98, width 95–100), post-anal seta (48–50) slightly longer than para-anal setae (33–35), anterior half lineate-reticulate, cribrum consisting of a terminal tuft with 3–4 irregular rows of spicules and a pair of anterior arms reaching level of posterior margin of anus (Figs. 2, 7); anal gland pores (*gv3*) on lateral margin of anal shield, slightly posterior of level para-anal setae. Soft opisthogastric cuticle with pair of elliptical metapodal plates (35–38 long × 8–10 wide), and 15 pairs of smooth setae (*Jv1–Jv5*, *Zv2–Zv*5, *R1–R4*, *UR*, *r6*) (54–60). Peritrematal shield well developed, bearing one gland pores (*gd3*) and one poroid (*id3*) at level near coxae II–III, poststigmatic extension of shield with two pairs of poroids (*id7* & *ip*) and one pair of gland pores (*gp*) (Figs. 2, 7); anterior region of peritrematal shield fused to anterior margin of dorsal shield behind setae *z1* (Figs. 2, 7). Peritremes relatively long, extending to mid-level of coxae I (Figs. 1, 2, 6, 7). Parapodal element behind coxae IV relatively thick and bearing gland pore *gv2*, fused to exopodal plate flanking coxae II–IV (Figs. 2, 7).

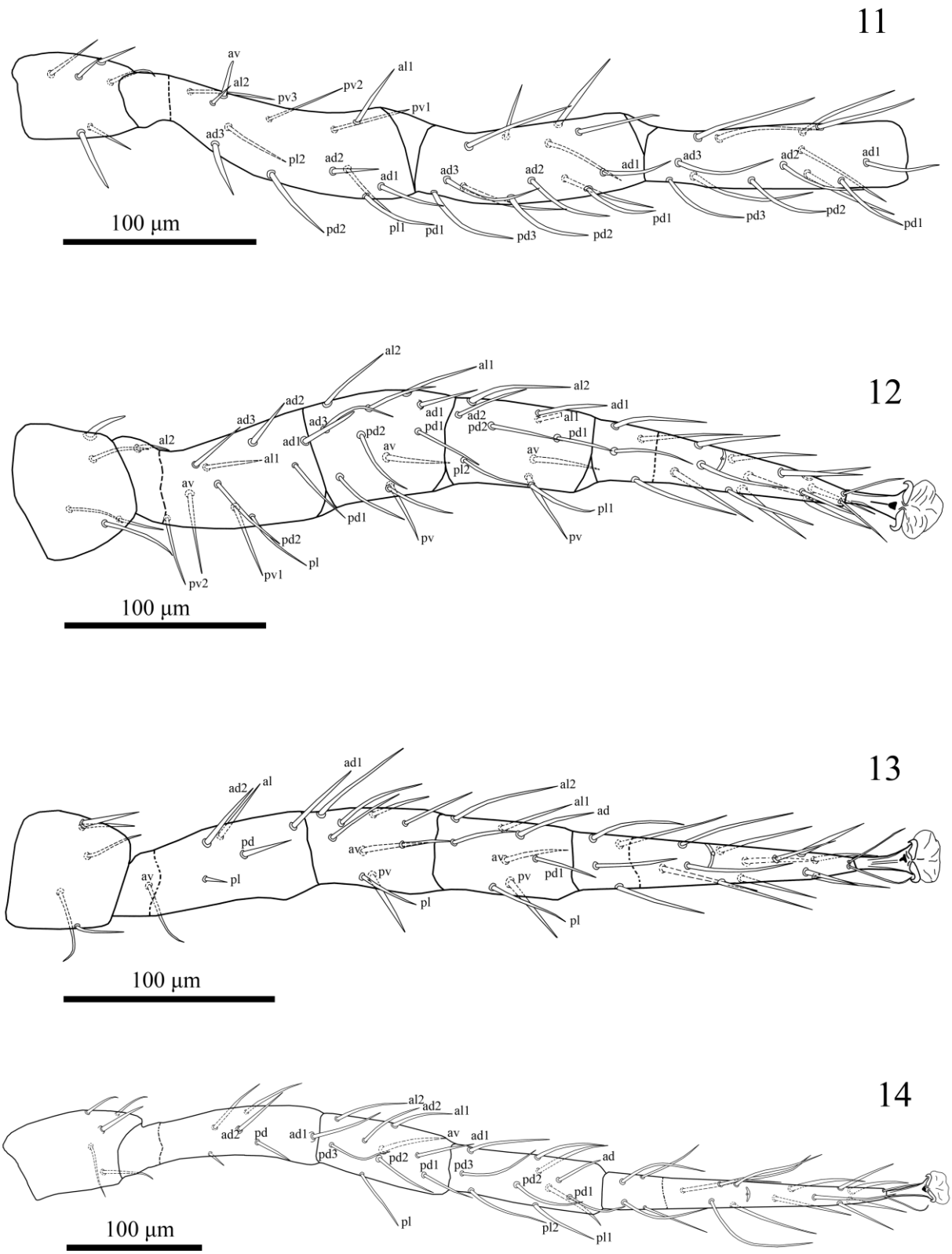
Gnathosoma (Figs. 3–5, 9–10) – Epistome subtriangular, smooth, with pointed apex (Fig. 4). Hypostomal groove with six transverse rows of denticles, each row with 8–13 tiny denticles, with smooth anterior and posterior transverse lines (Fig. 4). Hypostome with four pairs of smooth setae, *h3* (52–55) > *h1* (46–49) > *pc* (33–36) > *h2* (18–20) (Fig. 3). Corniculi robust and horn-like, extending beyond palptrochanter. Internal malae longer than corniculi, comprising a pair of pilose median projections, and 6–8 lateral, tentacle-like, smooth projections; labrum with pilose surface (Fig. 3). Chaetotaxy of palps (Fig. 10): trochanter 2, femur 5, genu 6, tibia 14, tarsus 15, all setae smooth; palp tarsal apotele two-tined (Fig. 10). Fixed digit of chelicera with an offset distal tooth (gabelzahn), followed by four teeth, a setaceous pilus dentilis, dorsal cheliceral setae prostrate, arthrodial membrane with a rounded flap and normal filaments; cheliceral dorsal and lateral lyrifissures distinct; movable digit with two teeth (Figs. 5, 9).

Legs (Figs. 11–14) – Legs II (464–475) and III (460–470) short, I (780–800) and IV (713–725) longer. Chaetotaxy normal for free-living Laelapidae: Leg I (Fig. 11): coxa 0-0/1, 0/1-0, trochanter 1-0/1, 1/2-1 (*pd* slightly thickened), femur 2-2/1, 3/3-2 (*av* and all dorsal setae slightly thickened), genu 2-3/2, 3/1-2, tibia 2-3/2, 3/1-2. Leg II (Fig. 12): coxa 0-0/1, 0/1-0, trochanter 1-0/1, 0/2-1, femur 2-3/1, 2/2-1 (*ad1* slightly thickened), genu 2-3/1, 2/1-2, tibia 2-2/1, 2/1-2. Leg III (Fig. 13): coxa 0-0/1, 0/1-0, trochanter 1-1/2, 0/1-0 (*ad* slightly thickened), femur 1-2/1, 1/0-1, genu 2-2/1, 2/1-1, tibia: 2-1/1, 2/1-1. Leg IV (Fig. 14): coxa 0-0/1, 0/0-0, trochanter 1-1/1, 0/1-1, 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*); with some ventral and lateral setae slightly thickened (Figs. 11–14). All pretarsi with paired claws, rounded pulvilli, and a long thin stalk.



Figures 6–10. DIC micrographs of *Nidilaelaps cubaensis* **sp. nov.** (female) – 6. Idiosoma in dorsal view; 7. Idiosoma in ventral view; 8. Genito-ventral shield; 9. Chelicera, lateral view; 10. Distal portion of palp, ventrolateral view, with a focus on apotele.

Insemination structures – Not seen, apparently unsclerotised.



Figures 11–14. *Nidilaelaps cubaensis* **sp. nov.** (female) – 11. leg I (trochanter-tibia); 12. leg II (trochanter-tarsus); 13. leg III (trochanter-tarsus); 14. leg IV (trochanter-tarsus).

Etymology

The specific name is derived from the country of origin, Cuba.

Remarks

Shaw (2012) erected the genus *Nidilaelaps* to accommodate three species, including *N. annectans* (the type species) that had previously been placed either in *Pseudoparasitus* or *Gymnolaelaps*, and recorded from mammals, birds, or their nests in Papua New Guinea and Australia (Womersley 1955; Evans and Till 1966; Domrow 1973; Shaw 2012). Afterwards, Joharchi *et al.* (2021) reported this genus for the first time from Afrotropical realm, based on specimens identified as *N. annectans*, collected from a native habitat at Nightingale Island and from imported stored food at Tristan Da Cunha Island. Since that time, there has been no other formal recording of *Nidilaelaps* in the world; in this publication a species of this genus is recorded for the first time in the Caribbean region. *Nidilaelaps* is superficially similar in its morphology to *Ulyxes* Shaw, *Androlaelaps* Berlese, *Haemolaelaps* Berlese, *Pseudoparasitus* Oudemans and *Gymnolaelaps* Berlese but this problem was comprehensively discussed by Shaw (2012, 2014). We consider *N. cubaensis* to be a member of *Nidilaelaps* because this species agrees well with *Nidilaelaps* in the following main character states: dorsal shield covering entire dorsum, holotrichous, with rather long dorsal setae, including 1–3 medial accessory *Jx* setae, having weakly sclerotized presternal area, without well-defined platelets, genito-ventral shield extensive (broad and long), bottle-shaped, abutting anal shield, shield ornamented posteromedially by 7–9 broad transverse cells and bearing setae inserted on or near the shield margins (not far inwards), paragenital poroids *iv5* located on soft cuticle lateral to shield (on its margins, not on shield); smooth epistome, 2-tined palp tarsal claw, normal shape of pilus dentilis, all leg setae simple, acicular, not barbed or apically bifid, genu IV *pd* seta fine and hence homomorphic with *ad1–2*, not stout, genua III and IV each with 9 setae (*pl2* absent). *Nidilaelaps cubaensis* **sp. nov.** most closely resembles *N. holdsworthi* Shaw, 2012 [first couplet in the identification key to *Nidilaelaps* species provided by Shaw (2012)], due to the insertion of *st5* and *Zv1* in the genito-ventral shield, but *N. cubaensis* **sp. nov.** can be easily distinguished from *N. holdsworthi* and the two other described congeners by having 40 pairs of smooth setae on dorsal shield, including three pairs of *Zx*, and three unpaired (*Jx*) setae (versus dorsal shield bearing 39 pairs of setae (including two pairs *Zx* setae) in the other species) and fixed digit of chelicera with five teeth (versus fixed digit of chelicera bearing less than five teeth in those species). Shaw (2012: 26) was unsure about the subfamilial placement of this genus, stating that the phoretical association with vertebrates places it in the Laelapinae, while the apparent predatory behaviour places it in the Hypoaspidinae. Nothing is known about the feeding habits or other aspects of the behaviour of this genus, and it is not possible to draw firm conclusions about the biology or host specificity of individual *Nidilaelaps* species, but their normal morphology (as other free-living Hypoaspidinae genera) - e.g. strong chelicerae with well-developed teeth, sclerotized and horn-like corniculi - suggests that they may be a predator of small invertebrates. So it seems unlikely that they are vertebrate parasites. We stress that further experimental work is needed to establish the true role of this mite in its respective ecosystems.

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گونهٔ جدیدی از جنس *Nidilaelaps* Shaw (Acari: Mesostigmata: Laelapidae) از کوبا

امید جوهرچی و سرگی ارمیلوف

موسسهٔ محیط‌زیست و کشاورزی (X-BIO)، دانشگاه ایالتی تیومن، تیومن، روسیه؛ رایانامه‌ها: J.omid2000@gmail.com، ermilovacari@yandex.ru

چکیده

نخستین گزارش از *Nidilaelaps* Shaw را در منطقهٔ کارائیب بر اساس گونهٔ جدید ***Nidilaelaps cubaensis* sp. nov.** جمع‌آوری شده از خاکبرگ جنگلی در کوبا ارایه می‌شود. گونهٔ جدید بر اساس ویژگی‌های ریخت‌شناسی مادهٔ بالغ توصیف و ترسیم و با گونه‌های مشابه مقایسه شده است.

واژگان کلیدی: نخستین گزارش، Gamasina، Monogynaspida، ناحیهٔ نئوتروپیکال، Parasitiformes، آرایه‌شناسی.

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