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GAEOLAELAPS CARABIDOPHILUS N. SP., A NEW MITE SPECIES (ACARI: MESOSTIGMATA: LAELAPIDAE) FROM CARABID BEETLES (COLEOPTERA: CARABIDAE) FROM SOUTHERN UKRAINE

Viacheslav A. TRACH

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Department of Zoology, I. I. Mechnikov Odessa National University, Shampanskij al., 2, 65058, Odessa, Ukraine. listoed@rambler.ru

ABSTRACT — *Gaeolaelaps carabidophilus* **n. sp.**, a new laelapine mite (Acari: Mesostigmata: Laelapidae) is described and illustrated based on females collected from *Stenolophus mixtus* (Herbst, 1784) (Coleoptera: Carabidae) on the north-western Black Sea coast (Ukraine, Odessa province). The new species differs from all congeners by the following combination of characters: dorsal soft cuticle hypertrichous, very short peritremes (reaching only to mid-coxa III), dorsal shield with only 39 pairs of setae, sternal shield with 3 pairs of lyrifissures.

KEYWORDS — *Gaeolaelaps*; Laelapidae; Mesostigmata; Acari; new species; Carabidae; Ukraine

INTRODUCTION

Gaeolaelaps is a large cosmopolitic genus of the laelapid mites, which currently includes approximately 100 described species (Walter and Moser, 2010). Halliday and Lindquist (2007) provided nomenclatural remarks on the use of the generic name *Gaeolaelaps* Evans and Till, 1966. The detailed review of the genus *Gaeolaelaps* Evans and Till, 1966 was provided by Beaulieu (2009).

Most *Gaeolaelaps* species were reported from soil-litter habitats, some others were collected from nests of vertebrates, from arthropods (or their nests), including mygalomorph spiders, millipedes, cockroaches, termites, mole crickets, cerambycid, passalid, carabid beetles and ants (Bregetova, 1977; Rosario, 1981; Tenorio, 1982; Karg, 1993; Strong and Halliday, 1994; Fain *et al.*, 1995; Beaulieu, 2009). Some of these species probably belong to other genera.

Only two species of *Gaeolaelaps* were previously encountered in Europe on ground beetles - *G. nolli* (Karg, 1962) on *Agonum fuliginosum* (Panzer) in Belgium and *G. aculeifer* (Canestrini, 1884) on *Carabus intricatus* Linnaeus in Poland (Fain *et al.*, 1995; Haitlinger, 2008). Probably, these records are occasional since these mites species are typical inhabitants of soil.

During a study on mites associated with beetles in Ukraine, an undescribed species of *Gaeolaelaps* mite was found on carabid beetles *Stenolophus mixtus* (Herbst) living on the north-western Black Sea Coast (Ukraine, Odessa province). The purpose of this paper is to describe this new species of *Gaeolaelaps*.

MATERIALS AND METHODS

Host beetles were collected by using an ultraviolet lamp. Mites collected from beetles were mounted on slides in Hoyer's medium. Morphology of mites was studied with aid of a stereomicroscope Mikmed-1 Lomo with binocular head AU-12, ocular micrometer AM9-2 and camera lucida RA-7U 4,2. The morphological nomenclature follows Evans and Till (1979). Measurements are given in micrometers (μm) for the holotype and all paratypes (in parentheses, from minimum to maximum).

The holotype and two paratypes (slide No 4-07-2010/01) are deposited in the collections of the Museum of Zoology, I. I. Mechnikov Odessa National University; other paratypes in the collections of the Department of Zoology I. I. Mechnikov Odessa National University; host beetles in the author's collection.

Gaeolaelaps carabidophilus Trach n. sp. (Figures 1 and 2)

Diagnosis — Body strongly swollen. Dorsal shield elongate oval, slightly narrowed posteriorly, with 39 pairs of setae, unpaired setae absent. Dorsal soft cuticle hypertrichous. Sternal shield with three pairs of lyrifissures. Epigynal shield narrow, with 7 (5 – 8) cells in the posterior area delimited by two lines forming an inverted-V and elongated longitudinal cells in the anterior part. Peritremes very short (reaching only to mid-coxa III). Fixed digit of chelicerae with 4 (4 – 6) teeth, movable digit with 2 large teeth.

Description — Female. Dorsum (Figure 1A). Body large, strongly swollen in all specimens, probably engorged on beetle haemolymph. Dorsal shield elongate oval, slightly tapering posteriorly from setae *r4*, with weak scale-like sculpture, 525 (465 – 549) in length, maximum width 256 (223 – 274) at level of setae *r3* - *r4*. Shield with 39 pairs of simple setae (*j1* - *6*, *z1* - *6*, *s1* - *6*, *r2* - *5*, *J1* - *5*, *Z1* - *5*, *px2* - *3*, *S1* - *5*). Setae *j1* (27 (25 - 30)) and *z1* (40 (34 - 46)) are short, other setae 46 - 76 (42 - 80) long. Dorsal shield with about 21 pairs of pore-like structures. Dorsal soft cuticle hypertrichous, with 36 (32 – 37) pairs of simple curved setae, 63 – 84 (57 – 90) long.

Venter — (Figure 2A). Tritosternum 116 (105 – 126) in length, with free plumose laciniae. Base of tritosternum weakly elongated, 27 (27 – 32) long, maximum width - 19 (17 – 20). Laciniae with 35 – 39 (32 – 44) denticles. Presternal area weakly sclerotized and granulate, consists of 9 (7 – 11) elongated cells. Sternal shield 147 (143 – 155) long, minimum width 101 (95 – 103) between coxae II, maximum width at the anterior part of the shield - 151 (143 – 166) and near posterior part of the coxa II - 141 (141 – 162). Sternal shield bearing three pairs of setae 40 – 46 (36 – 46) long and three pairs of lyrifissures, *iv3* located on the posterior margin of the shield. Weak cellular sculpture developed on the lateral margins of the shield. Setae *st4* located on soft cuticle, 46 (38 – 50) long. Epigynal shield narrow, with 7 (5 – 8) cells in the posterior area delimited by two lines forming an inverted-V and elongated longitudinal cells in the anterior area. Shield 170 (155 – 181) in length, maximum width - 61 (53 – 65), the vertex of the epigynal shield of variable shape: rounded or slightly pointed (Figures 1B - D). Epigynal shield with simple setae *st5*, (40 (36 – 46) long. Narrow endopodal platelets located near coxae III and IV, narrow exopodal platelets adjacent to coxae IV. A pair of paragenital platelets is located near the epigynal shield (11 – 13 (8 – 16) x 3 – 4 (2 – 4)). Opisthosomatic venter with two pairs of metapodal platelets: larger inner 17 (14 – 20) x 13 (8 – 17) and smaller external 8 (6 – 13) x 5 (4 – 6). Anal shield inversely subtriangular with a rounded base, well sclerotized, 105 (88 – 122) long, 76 (71 – 92) wide, bearing pair of pores. Cribrum well-developed. Length of preanal setae - 38 (29 – 38), postanal seta - 34 (32 – 36). Soft cuticle with four pairs of pores and 12 pairs of simple setae (*JV1* - *5*, *ZV1* - *4*, *UR* and 2 setae of *R*-series), 42 – 67 (40 – 80) long. Narrow peritremal shields fused with dorsal shield near setae *z1*. Peritremes very short, reaching only to mid-coxa III, 76 – 78 (67 – 82) long, 11 – 12 (8 – 12) wide near the middle. Peritrematal plates uniting with podonotal shield anteriorly at level between setae *s2* and *s3*. Spermathecal structures are indiscernible.

Gnathosoma — (Figures 1E - H). Tectum (Figure 1E) with anterior rounded and denticulate margin. Subcapitulum (Figure 1F) with six rows of deu-

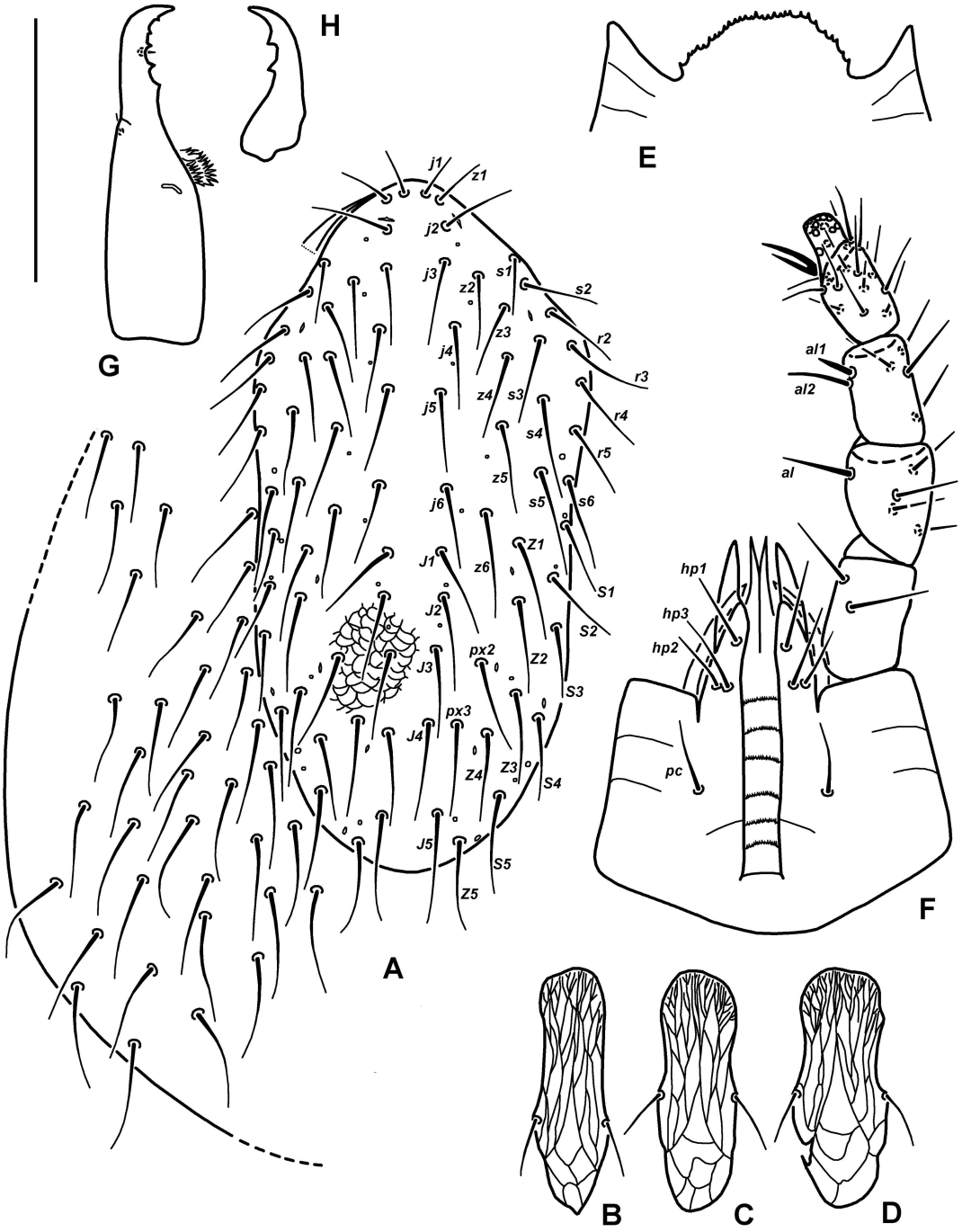


FIGURE 1: *Gaeolaelaps carabidophilus* Trach **n. sp.**: A – idiosoma, dorsal view; B-D – variety of shape of epigynal shields; E – tectum; F – subcapitulum and palp; G – movable digit of chelicerae; H – fixed digit of chelicerae. Scale bar: A-D 200 μm, E-H 100 μm.

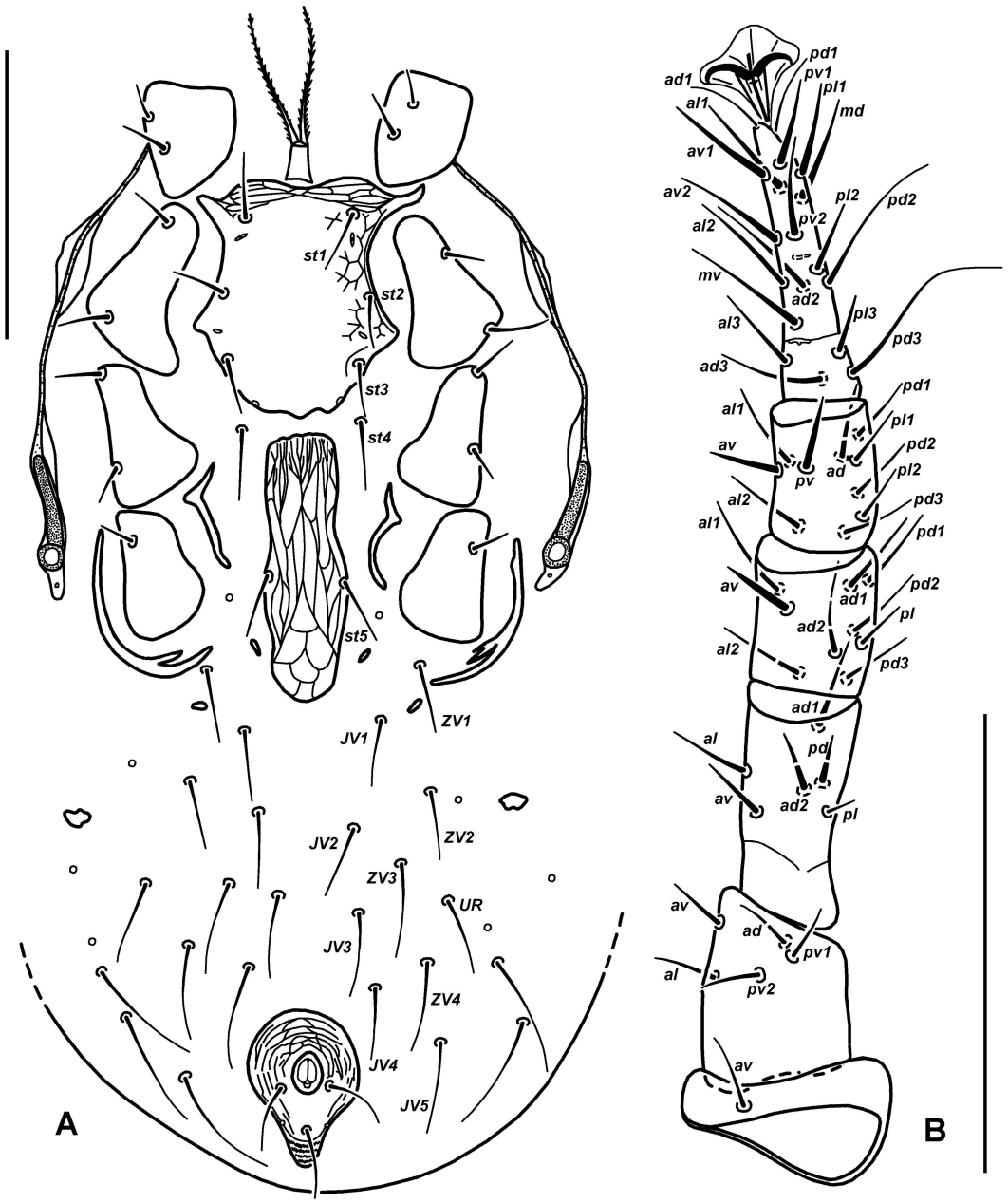


FIGURE 2: *Gaeolaelaps carabidophilus* Trach **n. sp.**: A – idiosoma, ventral view; B – leg IV. Scale bars 200 μm.

tosternal denticles. Row one with 5 (4 – 13) denticles, row two with 7 (7 – 18) denticles, row three with 11 (11 – 16) denticles, row four with 16 (13 – 16) denticles, row five with 9 (9 – 17) denticles, row six with 16 (9 – 18) denticles. Subcapitulum 137 (122 – 143) in length, 126 (118 – 134) in width. Corniculi horn-like. Hypostomal setae simple, length of setae *pc* - 26 (23 – 29), *hp1* - 36 (25 – 36), *hp2* - 23 (19 – 25), *hp3* - 33 (25 – 34). Palps 168 (164 – 176) long, seta *al* on femur slightly thickened, seta *al1* on genu strongly thickened, seta *al2* on genu slightly thickened and blunt-ended. Palptarsal apotele slender, 2-tined. Chaetotaxy of palps: 2-5-6-14-15. Several setae on palpal tibia and most setae on palpal tarsus blunt-ended. Second cheliceral segment 127 (118 – 132) in length, with fringed arthrodial corona, fixed digit of chelicerae with 4 (4 – 6) teeth and pilus dentilis (Figure 1G). Movable digit of chelicerae with two large teeth, its length - 59 (55 – 59) (Figure 1H).

Legs — Length of legs (excluding ambulacrum): I - 484 (446 – 530), II - 372 (344 – 400), III - 358 (326 – 391), IV - 474 (428 – 512). Clows I - IV well developed, claws on leg I smaller than on legs II - IV. Leg I chaetotaxy (from coxa to tibia): 2-6-13(2-2/1-3/3-2)-13(2-3/2-3/1-2)-13(2-3/2-3/1-2). Leg II - IV chaetotaxy (from coxa to tarsus): II - 2-5-11(2-3/1-2/2-1)-11(2-3/1-2/1-2)-10(2-2/1-2/1-2)-18(3-3/3-1/1-2/2-3); III - 2-5-6(1-2/1-1/0-1)-9(2-2/1-2/1-1)-8(2-1/1-2/1-1)-18(3-3/3-1/1-2/2-3); IV - 1-5-6(1-2/1-1/0-1)-9(2-2/1-2/1-1)-10(2-1/1-3/1-2)-18(3-3/3-1/1-2/2-3). Tarsus I with numerous setae, including one S-shaped seta near the apex. Seta *al* on trochanter II, setae *av* on femur, genu and tibia II, setae *av* and *pv* on genu and tibia III, seta *av* on genu IV, setae *av* and *pv* on tibia IV thickened (Figure 2B). On tarsi II - IV thickened setae *mv*, *av2*, *pv2*, *md* and, especially, *al1*, *pl1*, *av1*, *pv1*. Seta *pl2* on tarsi II - III also thickened. Setae *pl3* and *pl2* on tarsus IV very short, setae *pd2* and *pd3* very long.

Type material — Holotype (female, slide No 4-07-2010/01) and 7 paratypes were collected under elytra of 2 specimens of *Stenolophus mixtus* (Herbst) (Coleoptera: Carabidae) (4 specimens of *S. mixtus* were examined), 4 July 2010, sea coast, Ukraine, Odessa province, Belgorod-Dnestrovsky district, vicinity of Zatoka (46°00′ N, 30°23′ E), collected by V.A. Trach.

Etymology — The new species is named "*carabidophilus*" referring to its association with carabid beetles.

Remarks — The new species belongs to the genus *Gaeolaelaps* (following the concept of genus as defined by Beaulieu (2009)), because it is characterized by dorsal shield with 39 pairs of simple setae, sternal shield longer than its width, presternal area weakly sclerotized, epigynal shield tongue-shaped, ventral hypertrichy absent, tectum with anterior rounded and denticulate margin, six rows of deutosternal denticles, well-developed chelate-dentate chelicerae and normal laelapid leg setation.

The new species differs from species of other laelapine mite genera associated with beetles (*Coleolaelaps* Berlese, 1914 and *Hypoaspis* Canestrini, 1884) by the absence of long setae on the dorsal shield and on some leg segments, number of dorsal setae and other characters (Joharchi and Halliday, 2011).

Differential diagnosis. *Gaeolaelaps carabidophilus* Trach **n. sp.** differs from all congeners by the following combination of characters:

- dorsal soft cuticle hypertrichous;
- very short peritremes (reaching only to mid-coxa III);
- dorsal shield with only 39 pairs of setae;
- sternal shield with 3 pairs of lyrifissures.

By the hypertrichous dorsal soft cuticle, *Gaeolaelaps carabidophilus* Trach **n. sp.** is similar to *G. millipedus* Rosario, 1981 and *G. angustiscutatus* (Willmann, 1951). It differs from the first species by shorter dorsal shield, longer dorsal setae, lack of unpaired setae on the dorsal shield, sternal shield with 3 pairs of lyrifissures, short peritremes (in *G. millipedus*, longer dorsal shield, shorter dorsal setae, dorsal shield with some unpaired median setae, sternal shield only with 2 pairs of lyrifissures, peritremes of normal length). *G. carabidophilus* Trach **n. sp.** differs from *G. angustiscutatus* by the shape of dorsal shield, longer dorsal setae, length of peritremes (very short in *G. carabidophilus* Trach **n. sp.** and of normal length in *G. angustiscutatus*), shape of the tectum and digits of the chelicerae (4 (4 - 6) teeth

on fixed digit, 2 teeth on movable digit in *G. carabidophilus* Trach **n. sp.**, and about 10 on both digits in *G. angustiscutatus*).

Two more species of the genus *Gaeolaelaps* also have shortened peritremes - *G. nolli* (Karg, 1962) and *G. similisetae* (Karg, 1965). *G. nolli* also has chelicerae similar in shape to *G. carabidophilus* Trach **n. sp.** These species clearly differ from *G. carabidophilus* Trach **n. sp.** By the shape of dorsal shield (suboval in *G. nolli* and *G. similisetae*, elongate oval and slightly narrowed posteriorly in *G. carabidophilus* Trach **n. sp.**), shorter dorsal setae (for example, in *G. nolli* and *G. similisetae* dorsal setae *j2 - 4* not reaching to base of next row setae, in *G. carabidophilus* Trach **n. sp.** *j2 - 4* always reaching to base of next row setae), shorter peritremes (in *G. nolli* and *G. similisetae*, peritremes ending near the middle of coxae II, in *G. carabidophilus* Trach **n. sp.**, peritremes ending near the middle of coxae III).

By the shape of dorsal shield, *G. carabidophilus* Trach **n. sp.** is also similar to a group of species which have dorsal shield tapering posteriorly (*G. angustiscutatus*, *G. angusta* (Karg, 1962), *G. fishtowni* Koehler and Ruf, 1993, *G. queenslandica* Womersley, 1956). Females of *G. angusta*, *G. fishtowni* and *G. queenslandica* have peritremes of normal length, a large spur-like seta on femur II (only slightly thickened in *G. carabidophilus* Trach **n. sp.**) and lack dorsal hypertrichy. A comparison with *G. angustiscutatus* has been given above.

The morphology of the new species confirms the opinion of Beaulieu (2009) that many of arthropod-associated mites species have rare or unique characteristics of *Gaeolaelaps*.

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