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New records of carabid-associated mesostigmatic mites (Acari: Mesostigmata) from Ukraine with description of adults of *Halodarcia carabidophila* Evans and Fain, 1995 (Halolaelapidae)

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ABSTRACT — New records of mesostigmatic mites (Acari: Mesostigmata) associated with carabid beetles (Coleoptera: Carabidae) from the Ukraine are presented. Two genera (*Panteniphis* Willmann, 1949, *Halodarcia* Karg, 1969) and six species (*Panteniphis mirandus* Willmann, 1949, *Halodarcia carabidophila* Evans and Fain, 1995, *H. incideta* Karg, 1969, *Antennoseius calathi* Fain, Noti and Dufrêne, 1995, *Anystipalpus labiduricola* Lindquist and Moraza, 2009, *Gaeolaelaps similisetae* (Karg, 1965)) are recorded for the first time in the Ukraine. The adults of *Halodarcia carabidophila* obtained in the laboratory were described for the first time. A key to the females of *Halodarcia* species is also provided.

KEYWORDS — Acari; Mesostigmata; phoresy; Carabidae; Ukraine; *Halodarcia carabidophila*

INTRODUCTION

The Mesostigmata (Gamasida) is a large, cosmopolitan assemblage of parasitiform mites that embraces an unusually diverse variety of lifestyles and habitats (Lindquist *et al.*, 2009). Deutonymphs and adults of many families of Mesostigmata have established close phoretic relationships with other arthropods and, less commonly, with vertebrates (Krantz, 2009). Over 95% species of arthropod-associated mesostigmatic mites are insect associates. The insect orders Coleoptera, Hymenoptera, Diptera and Lepidoptera are the primary hosts of mesostigmatid mites (Hunter and Rosario, 1988). Beetles of the families Carabidae, Curculionidae, Geotrupidae, Histeridae, Lucanidae, Silphidae, Scarabaeidae, Staphylinidae,

etc. are common phoretic hosts for the mesostigmatic mites in Europe.

Many members of the genera *Panteniphis* Willmann, 1949 (Digamasellidae), *Stylochirus* G. and R. Canestrini, 1882 (Ologamasidae), *Halodarcia* Karg, 1969 (Halolaelapidae), *Antennoseius* Berlese, 1916 and *Anystipalpus* Berlese, 1911 (Ascidae) are strictly associated with carabid beetles (Bregetova, 1977c; Haitlinger, 1988; Evans and Fain, 1995; Gwiazdowicz, 2000a; Lindquist and Moraza, 2009; Lindquist *et al.*, 2009). Phoresy on carabids was also observed, although rarely, in members of the genera *Parasitus* Latreille, 1795, *Poecilochirus* G. and R. Canestrini, 1882 (Parasitidae), *Dendrolaelaps* Halbert, 1915 (Digamasellidae), *Alliphis* Halbert, 1923 (Eviphididae), *Macrocheles* Latreille, 1829

(Macrochelidae), *Gaeolaelaps* Evans and Till, 1966 (Laelapidae) (Haitlinger, 1988, 2004, 2008; Gwiazdowicz, 2000b; Salmane and Telnov, 2009; Trach, 2012b, 2016; personal observations).

The fauna of arthropod-associated Mesostigmata in Ukraine is very poorly known. The purpose of this paper is to add new records of carabid-associated mesostigmatic mites from Ukraine and to describe unknown adults *Halodarcia carabidophila*.

MATERIALS AND METHODS

Carabid beetles were collected in various natural zones and administrative regions of Ukraine. Beetles were sampled by hand, by using Barber traps with bait and by using UV lamp (mercury tungsten blended lamp or mercury vapor lamp). Carabids were transferred into vials containing 70 % ethyl alcohol and later were examined with aid of a microscope MBS-9.

Mites collected from carabids were cleared in lactic acid and slide-mounted in Hoyer's medium. Morphology of mites was studied with the aid of a compound microscope, a Mikmed-1 Lomo equipped with a binocular head AU-12, ocular micrometer AM9-2 and digital camera DCM900. The morphological terminology generally follows Evans and Till (1979). Dorsal setae were labelled according to the system of Lindquist and Evans (1965), but our designations are preliminary. Dorsal pore-like structures, glandular openings (solenostomes) and poroids (lyrifissures) are indistinct and have been named as pores. Palpal and leg chaetotaxy follows Evans (1963a, b, 1969). Measurements are given in micrometres (μm). Lengths of shields were taken from the anterior to posterior shield margins along the midline. The length of the second cheliceral segment was measured from the base to the apex of the fixed digit. Leg length was taken from the base of the coxa to the apex of the tarsus, excluding the ambulacrum.

For biological studies of *Halodarcia carabidophila*, well-fed and swollen deutonymphs (collected in the vicinity of Berezovka, 26 Mar. 2011, see examined material) were removed from carabids and placed into glass or plastic 25 ml jars, the lower part

of which was filled with a solid mixture of gypsum and charcoal (according to Karg, 1971). High humidity was maintained in these vessels by frequently adding water to the gypsum-charcoal substrate. The mites developed at a temperature of about 20°C. The adult mites were obtained after two to seven days.

Slide-mounted voucher specimens are deposited in the collections of the Department of Zoology, I. I. Mechnikov Odessa National University. Mite taxonomy follows Beaulieu *et al.* (2011), carabid taxonomy follows Kryzhanovskij *et al.* (1995).

RESULTS

Suborder Trigynaspida Camin and Gorirossi, 1955

Infraorder Antennophorina Camin and Gorirossi, 1955

Family Schizogyniidae Trägårdh, 1950

Genus *Euroschizogynium* Trach and Seeman, 2014 *Euroschizogynium calvum* Trach and Seeman, 2014

Material examined — one male from *Scarites terricola* Bonelli, 1813, Ukraine, Kherson Region, Skadovsk District, Dzharylhach island (46°02'N, 32°55'E), shore of salt puddle, 18 – 21 Aug. 2014, V. Trach coll.

Distribution — Ukraine (Trach and Seeman, 2014).

Remarks — The genus *Euroschizogynium* is monotypic and known only from the type series from Odessa region of Ukraine; mites were also found on *S. terricola* (Trach and Seeman, 2014). Mites were located on the thorax and abdomen of the beetles. The biology of the Schizogyniidae is generally unknown, but some species are associated with passalid, bark and carabid beetles (Trägårdh, 1950; Kinn 1966; Hirschmann 1972; Trach and Seeman, 2014).

**Suborder Monogynaspida Camin and Gorirossi,
1955**

Infraorder Gamasina Kramer, 1881

Family Digamasellidae Evans, 1957

Genus *Panteniphis* Willmann, 1949

***Panteniphis mirandus* Willmann, 1949**

Material examined — one deutonymph from *Chlaenius* sp., Ukraine, Chernigiv Region, Korop District, Desna River shore, 03 July 1973, unknown coll.; eight deutonymphs from *Bembidion* sp., same data; five deutonymphs from *Omophron limbatum* (Fabricius, 1777), same data; thirteen deutonymphs from *Bembidion* sp., Ukraine, Crimea, Yalta City Municipality, vicinity of Yalta (44°29'N, 34°05'E), Uchan-Su River valley, 17 Juny 2001, A. Khaustov coll.; four deutonymphs from undetermined Carabidae, Ukraine, Odessa Region, Kiliya District, vicinity of Primorskoe (45°30' N, 29°38' E), meadow, 01 May 2003, V. Trach coll.; one deutonymph from *Bembidion* sp., Ukraine, Crimea, Yalta City Municipality, vicinity of Sovetskoe (44°32' N, 34°12' E), Canyon Uch-Kosh, 22 Apr. 2001, A. Khaustov coll.; one deutonymph from *Bembidion tetracolum* Say, 1823, same data; two deutonymphs from *Agonum* sp., Ukraine, Odessa Region, Berezovka District, vicinity of Berezovka (47°10' N, 30°56' E), floodplain forest near Tiligul River, 26 Mar. 2011, V. Trach coll.; six deutonymphs from *Bembidion* sp., Ukraine, Zakarpattia Region, Khust District, vicinity of Kryva (48°10'N, 23°15'E), Tisa River shore, 11 – 17 Aug. 2011, V. Trach coll.

Distribution — Poland, France, Russia, Moldova, Latvia, Slovakia (Bregetova, 1977a; Karg, 1993; Gwiazdowicz, 2000a; Fend'a, 2002; Salmane, 2007).

Remarks — *P. mirandus* is a rare edaphic species. Deutonymphs of *P. mirandus* was described by Gwiazdowicz (2000a) from *Carabus* sp. from Poland. We found carabids with mites only in riparian areas. Mites are phoretic under the elytra of beetles. The genus *Panteniphis* is new to the fauna of Ukraine.

Family Halolaelapidae Karg, 1965

Genus *Halodarcia* Karg, 1969

Remarks — So far, four species of genus *Halodarcia* have been described world-wide, three of them from Europe — *Halodarcia incideta* Karg, 1969, *H. porolata* Karg, 1969, *H. carabidophila* Evans and Fain, 1995 and *H. kargi* Nikolsky, 1982 from Asia (Karg, 1969; Nikolsky, 1982; Evans and Fain, 1995). Adult mites of the genus *Halodarcia* are free-living in litter and humus in damp or wet situations; deutonymphs, of at least some species, are subelytral phoretics of carabid beetles (Evans and Fain, 1995).

***Halodarcia carabidophila* Evans and Fain, 1995
(Figures 1 and 2)**

Material examined — two deutonymphs from *Agonum* sp., Ukraine, Odessa Region, Berezovka District, vicinity of Berezovka (47°10'N, 30°56'E), floodplain forest near Tiligul River, 01 Apr. 2001, V. Trach coll.; seven deutonymphs from *Agonum* sp., same locality, 16 Apr. 2003, V. Trach coll.; ten deutonymphs from *Agonum* sp., same locality, 26 Mar. 2011, V. Trach coll.; one deutonymph from *Agonum* sp., Ukraine, Odessa Region, Belyaevka District, vicinity of Troitskoe (46°32'N, 30°00'E), floodplain forest near Turunchuk River, 21 Mar. 2009, V. Trach coll.; one deutonymph from undetermined Carabidae, Ukraine, Odessa Region, Belgorod-Dnestrovsk District, vicinity of Zatoka (46°01'N, 30°24'E), Black Sea Coast, 04 July 2010, V. Trach coll.; three deutonymphs from *Necrodes littoralis* (Linnaeus, 1758) (Coleoptera: Silphidae), Ukraine, Odessa Region, Belyaevka District, vicinity of Belyaevka (46°25' N, 30°10' E), floodplain forest near Dniester River, 22 Juny 2011, V. Trach coll.

Distribution — Belgium (Evans and Fain, 1995).

Remarks — Deutonymphs of *Halodarcia carabidophila* was described from carabids *Agonum* spp. and *Pterostichus* spp. from Belgium (Evans and Fain, 1995). Records of *H. carabidophila* on the necrophagous silphid *N. littoralis* may represent a fortuitous attempt to disperse phoretically on an accidental host. The genus *Halodarcia* is new to the fauna of Ukraine. The adult stages of *H. carabidophila* obtained in the laboratory are herein described for the first time.

FIGURE 1: *Halodarcia carabidophila* Evans and Fain, 1995, female: A – idiosoma, dorsal view (setae of the soft cuticle in the podonotal region on the left side were not drawn); B – idiosoma, ventral view; C-D – variety of shape of anal shields; E – gnathotectum; F – subcapitulum and palp; G – chelicera. Male: H – idiosoma, ventral view; I – gnathotectum; J – corniculus; K – variety of shape of chelicerae. Scale bar: A-D, H 200 μ m, E, G, I, K, L 100 μ m, F, J 200 μ m.

Diagnosis — Adult female with 24 pairs of setae (*j2-j6*, *z2-z6*, *s1*, *s3-s5*, *J1*, *J2*, *J4*, *J5*, *Z1-Z5*, *S2*) on dorsal shield; sternal shield divided medially; epigynal shield rounded posteriorly; ventri-anal shield elongated, with 2 pairs of preanal setae (*JV2*, *JV3*) and circum-anal setae; soft opisthosomal integument hypertrichous; gnathotectum with denticulate lateral margins and tapering undivided median process. Gnathotectum of adult male with smooth lateral margins and tapering median process; spermatodactyl large and curved, longer than movable digit. Deutonymph with 15 pairs of setae (*j1-j6*, *z2-z6*, *s2*, *s3*, *s5*, *s6*) on podonotal shield and normally 10 pairs of setae (*J1*, *J2*, *J4*, *J5*; *Z1-Z5*, *S2*) on opisthonotal shield, setae *S1* on soft cuticle; cheliceral digits stout with teeth of movable digit weak.

Description of female (n = 4) — Dorsum (Figure 1A). Dorsal shield obovate, length 622 – 651, maximum width 353 – 363, tapering anteriorly from setae *s5* and posteriorly from setae *Z1*. Surface of shield essentially smooth. Dorsal shield with 24 pairs of setae (*j2-j6*, *z2-z6*, *s1*, *s3-s5*, *J1*, *J2*, *J4*, *J5*, *Z1-Z5*, *S2*), 12 pairs of distinguishable pores and posterodorsal cribrum (terminology by Krantz, 2016), setae *J3* absent. Setae *j1* and *z1* located on fused anteriorly peritrematal shields. Fusion of the dorsal shield with peritrematal shields indistinguishable. Anterior soft lateral integument with 7 pairs of setae (*s2*, *s6*, *r2-r6*) and one pair of pores; posterior soft lateral integument hypertrichous, with about 20 pairs of setae, pores not distinguishable. Most dorsal setae slightly serrated, length 19 – 29.

Venter (Figures 1B-D) — Tritosternum with elongated base and pilose laciniae, base of tritosternum length 36 – 38, laciniae length 50 – 57. Presternal shields elongated, free. Sternal shield divided medially; shield with elongate antero-lateral corners, shield surface evenly sclerotized, with faint longitudinal and transverse lines, bearing 3 pairs of setae and 2 pairs of pores, setae *st2* and *st3* thickened. Length *st1* 29 – 34, *st2-st3* 25 – 29, maximum width of sternal shield at anterior part, 235 – 252 including endopodal strips. Sternal shield fused with endopodal plates of coxae II/III, coxae III/IV and parapodal platelets. Setae *st4* located on metasternal shields, length *st4* 34 – 38. Pores *iv3* lacking.

Epigynal shield triangular, anteriorly elongated and pointed, posterior margin rounded, bearing simple setae *st5*. Epigynal shield length 189 – 202, maximum width 126 – 160, length *st5* 40 – 46. Inguinal gland platelet with two *gv2* pores, pores *iv5* present. Ventri-anal shield elongated and reticulated, with rounded anterolateral corners, length 185 – 202, maximum width 109 – 118, cribrum well developed. In one specimen seta *JV2* on separate plate (Figure 1C). Shield bearing 2 pairs of simple preanal setae (*JV2*, *JV3*), para-anal, post-anal setae and pair of pores (*gv3*), length of preanal setae 36 – 55, length of para-anal setae 36 – 40, length of post-anal seta 38 – 42. Soft opisthosomal integument hypertrichous, with 20 – 21 pairs of setae (*S1*, *S3-S5*, *R1-R7* and 9 – 10 pairs setae of *UR*-series) and pair of metapodal plates, length 8 – 11, width 25 – 32. Longer setae smooth, length 38 – 46, shorter setae slightly serrated, length 21 – 29. Peritrematal shields narrowly fused with exopodal plates of coxae III/IV, bearing at least 2 pairs of pores, shields anteriorly weakly reticulated, peritremes extending to level of dorsal setae *z2*. Exopodal plates of coxae II/III free. Spermathecal structures indiscernible.

Gnathosoma — Gnathotectum (Figure 1E) with denticulate lateral margins and tapering undivided median process. Subcapitulum 189 – 197 maximum width, with seven rows of deutosternal denticles, 15 – 25 denticles per row, subcapitular groove indistinct (Figure 1F). Hypostomal setae simple, *pc* length 38 – 42, *hp1* 32 – 36, *hp2* 27 – 29, *hp3* 36 – 40. Corniculi horn-like. Palp length 231 – 239, chaetotaxy of palps 2–5–6–14–15, setae *v1* on trochanter, *d1*, *d3*, *pl* on femur slightly serrated, setae *v2* on trochanter, *al* on femur, *al1* on genu serrated, seta *al2* on genu brush-like, palptarsal apotele 3-tined. Second cheliceral segment length 155 – 166, fixed digit with 3 – 4 proximal teeth and one small pre-apical teeth, pilus dentilis short, movable digit with 4 – 5 teeth (Figure 1G).

Legs (Figures 2A-D) — Leg lengths: I 688 – 725, II 549 – 586, III 502 – 530, IV 688 – 707. Chaetotaxy: leg I (from coxa to tibia): 2, 6 (1–0/1–1/2–1), 13 (2–3/1–2/3–2), 13 (2–3/2–3/1–2), 13 (2–3/2–3/1–2); leg II: 2, 5 (1–0/1–0/2–1), 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–

FIGURE 2: *Halodarcia carabidophila* Evans and Fain, 1995, female: A – leg I (from coxa to tibia); B – leg II; C – leg III; D – leg IV. Scale bar 200 μ m.

2/2–3); leg III: 2, 5 (1–0/1–0/2–1), 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); leg IV: 1, 5 (1–0/1–0/2–1), 6 (1–2/1–1/0–1), 10 (2–2/1–3/1–1), 10 (2–1/1–3/1–2), 18 (3–3/3–1/1–2/2–3). Claws I–IV well developed, ambulacral stalk of legs II–IV with long acuminate paradactyli. Most setae slightly thickened and serrated. Coxae II with small anterior spine.

Description of male (n = 7) — Dorsum. Dorsal shield fused anteriorly and laterally with peritrematal shields, and fused posteriorly with ventri-anal shield, length 456 – 530, maximum width 353 – 409. Surface of shield with faint scale-like ornamentation throughout (in contrast with that of female). Chaetotaxy as in female. Dorsal setae length 17 – 27.

Venter (Figure 1H) — Base of tritosternum length 17 – 19, laciniae length 34 – 38. Sternogenital shield length 219 – 235, surface essentially smooth, bearing 5 pairs of simple setae (length 25 – 32). Soft opisthosomal integument not hypertrichous. Large ventri-anal shield fused with dorsal and peritrematal shields, bearing 10 pairs of simple preanal setae (JV1–JV5, ZV1–ZV5), para-anal, post-anal setae and pair of pores. Length of preanal setae 29 – 38, length of para-anal setae 29 – 36, length of post-anal seta 32 – 36. Surface of ventri-anal shield ornamentation as for dorsal shield. Other characters as in female.

Gnathosoma — Most features of gnathosoma as in female. Gnathotectum (Figure 1I) with smooth lateral margins and tapering median process. Subcapitulum 189 – 197 maximum width, hypostomal setae lengths: *pc* 25 – 32, *hp1* 21 – 25, *hp2* 17 – 21, *hp3* 21 – 25. Corniculi more pointed than in female (Figure 1J). Palps length 185 – 202. Second cheliceral segment (Figures 1K–L) length 109 – 126, fixed digit with 2 – 3 tooth, pilus dentilis short, movable digit with one large tooth, spermatodactyl large and curved, longer than movable digit.

Legs — As in female. Leg lengths: I 539 – 632, II 437 – 474, III 391 – 446, IV 549 – 623.

Remarks — At present, all four species of the genus *Halodarcia* are known from females, three species (*H. carabidophila*, *H. incideta*, *H. kargi*) are known from males and three species (*H. carabidophila*, *H. incideta*, *H. porolata*) are known from

deutonymphs. The key to deutonymphs of the genus *Halodarcia* was presented by Evans and Fain (1995). The male of *H. carabidophila* and *H. incideta* are distinguished from male of *H. kargi* by the shape of the gnathotectum (in *H. kargi* anterior margin of gnathotectum with 3 sets of denticulate tips; in *H. carabidophila* and *H. incideta* gnathotectum with smooth lateral margins and tapering median process) and the shape of spermatodactyl (in *H. kargi* weakly curved, approximately equal in length to movable digit; in *H. carabidophila* and *H. incideta* spermatodactyl strongly curved, longer than movable digit). The difference between males of *H. carabidophila* and *H. incideta* is not clear.

Key to the females of *Halodarcia* Karg, 1969

1. Ventri-anal shield with one pair of preanal setae... 2
— Ventri-anal shield with two pairs of preanal setae... 3
2. Sternal shield incised between setae *st2* and *st3*. Ventri-anal shield slightly rounded anteriorly, shield broadest in its anterior third *H. porolata* Karg, 1969
— Sternal shield not incised. Ventri-anal shield broadly rounded anteriorly, broadest at mid-way..... *H. kargi* Nikolsky, 1982
3. Sternal shield divided medially. Epigynal shield rounded posteriorly. Dorsal setae *S1*, *S3*, *S4* inserted on lateral soft cuticle..... *H. carabidophila* Evans and Fain, 1995
— Sternal shield not divided medially. Epigynal shield not rounded posteriorly. Setae *S1*, *S3*, *S4* located on dorsal shield *H. incideta* Karg, 1969

Halodarcia incideta Karg, 1969

Material examined — six deutonymphs from *Agonum* sp., Ukraine, Odessa Region, Berezovka District, vicinity of Berezovka (47°10'N, 30°56'E), floodplain forest near Tiligul River, 09 Mar. 2001, V. Trach coll.; three deutonymphs from *Agonum* sp.,

same locality, 13 Mar. 2001, V. Trach coll.; two deutonymphs from *Agonum* sp., same locality, 01 Apr. 2001, V. Trach coll.; three deutonymphs from *Bembidion* sp., Ukraine, Crimea, Yalta City Municipality, vicinity of Yalta (44°29'N, 34°05'E), Uchan-Su River valley, 17 Juny 2001, A. Khaustov coll.; two deutonymphs from *Bembidion tetracolum* Say, 1823, same locality, 24 Apr. 2010, A. Khaustov coll.; three deutonymphs from *Bembidion tetracolum* Say, 1823, same locality, 06 Juny 2010, A. Khaustov coll.; five deutonymphs from undetermined Carabidae, Ukraine, Odessa Region, Kiliya District, vicinity of Primorskoe (45°30'N, 29°38'E), meadow, 01 May 2003, V. Trach coll.; five deutonymphs from *Chlaenius* sp., Ukraine, Odessa Region, Belyaevka District, vicinity of Troitskoe (46°32'N, 30°00'E), floodplain forest near Turunchuk River, 21 Mar. 2009, V. Trach coll.

Distribution — Germany, Belgium, Latvia (Karg, 1969; Evans and Fain, 1995; Salmane, 2005).

Remarks — The species is new to the fauna of Ukraine.

Family Ologamasidae Ryke, 1962
Genus *Stylochirus* G. and R. Canestrini 1882

Remarks — The systematic position of the genus *Stylochirus* was analysed by Mašán and Halliday (2010). The genus *Stylochirus* includes about 15 species, distributed mainly in the Palaearctic region, three species are known in Ukraine — *Stylochirus fimetarius* Müller, 1860, *S. multiclavatus* (Willmann, 1953), *S. physogastris* (Karg, 1971) (Bregetova, 1977b). Deutonymphs of some *Stylochirus* have been found phoretic on carabid beetles (Davydova, 1975; Bregetova, 1977b; Nikolsky, 1981; Gwiazdowicz, 2000b; Salmane and Telnov, 2009).

***Stylochirus fimetarius* Müller, 1860**

Material examined — five deutonymphs from *Pterostichus melanarius* (Illiger, 1798), Ukraine, Crimea, Yalta City Municipality, vicinity of Alupka (44°27'N, 34°02'E), Ai-Petri, Crimean Mountains, 09 Sep. 2001, A. Khaustov coll.; one deutonymph from *Carabus auronitens* Fabricius, 1792, Ukraine, Zakarpattia Region, Rahiv District, vicinity of

Bilyn (48°06'N, 24°12'E), Carpathian Mountains, polonyna Dumyn, 19 May 2002, A. Gontarenko coll.; five deutonymphs from *Carabus gyllenhalii* Fischer von Waldheim, 1827, Ukraine, Crimea, Yalta City Municipality, vicinity of Yalta (44°31'N, 34°08'E), Crimean Mountains, 27 Sep. 2005, V. Trach coll.; thirteen deutonymphs from *Carabus convexus* Fabricius, 1775, Ukraine, Odessa Region, Kodyma District, vicinity of Alexandrovka (48°00'N, 29°14'E), forest, 23 May 2009, V. Trach coll.; two deutonymphs from *Carabus cancellatus* Illiger, 1798, Ukraine, Crimea, Bahchisaray District, vicinity of Verhnyaya Kutuzovka (44°44'N, 34°20'E), pond of Kutuzovskoe Lake, 26 May 2010, A. Khaustov coll.

Distribution — Palaearctic (Bregetova, 1977b).

Remarks — Mites of *S. fimetarius* were found on the ventral or dorsal side of beetles and under the elytra.

Family Ascidae Voigts et Oudemans, 1905
Genus *Antennoseius* Berlese, 1916

Remarks — The genus *Antennoseius* includes about 60 species. Currently, 15 species are reported from Ukraine — *Antennoseius avius* (Karg, 1976), *A. bacatus* Athias-Henriot, 1961, *A. borussicus* Sellnick, 1945, *A. bullitus* Karg, 1969, *A. dungeri* Karg, 1965, *A. kamalii* Moraza and Kazemi, 2009, *A. longisetus* Eidelberg, 2000, *A. maltzevi* Eidelberg, 1994, *A. masoviae* Sellnick, 1943, *A. multisetus* Eidelberg, 2000, *A. ovaliscutalis* Eidelberg, 2000, *A. pannonicus* Willmann, 1951, *A. ponticus* Tratsch and Makarova, 2008, *A. pseudospinosus* Eidelberg, 1990, *A. sharonovi* Eidelberg, 1989 (Bregetova, 1977c; Balan, 1980; Eidelberg, 1989, 1990, 1994, 2000; Sklyar, 1994, 2001; Trach and Makarova, 2008; Trach, 2013). Mites were reported from soil-litter habitats (soil, moss, humus, substrate of salt marshes, nests of rodents), and females of many species are phoretic under the elytra of carabid beetles. Some species were found both on insects and in the soil. Some Nearctic species of the subgenus *Vitzthumia* Thor, 1930 and some Palaearctic species of the nominative subgenus show female dimorphism, with edaphic and phoretic forms (Lindquist and Walter, 1989; Beaulieu *et al.*, 2008; personal observations).

***Antennoseius (s. str.) bullitus* Karg, 1969**

Material examined — four females from *Pterostichus* sp., Ukraine, Kirovograd Region, Znamenka District, vicinity of Bogdanovka (48°45'N, 32°32'E), forest, 29 Apr. 2001, V. Trach coll.; one female from litter, Ukraine, Odessa Region, Odessa City, (46°33'N, 30°45'E), park, 01 Mar. 2008, V. Trach coll.; thirteen females from undetermined Carabidae, Ukraine, Crimea, Yalta City Municipality, vicinity of Yalta (44°31'N, 34°07'E), Crimean Mountains, 23 Aug. 2008, A. Khaustov coll.

Distribution — Central Europe, Ukraine (Cherkasy and Lugansk Regions), Kazakhstan, Siberia (Karg, 1969, 1993; Balan, 1980; Chelebiev, 1984; Haitlinger, 1988; Gwiazdowicz, 2007; Kontschán, 2007; Marchenko, 2012; Trach, 2013).

Remarks — *A. bullitus* is known from soil-litter habitats and carabid beetles (Haitlinger, 1988; Karg, 1993; Trach, 2013).

***Antennoseius (s. str.) calathi*
Fain, Noti and Dufrêne, 1995**

Material examined — two females from *Chlaenius* sp., Ukraine, Odessa Region, Belyaevka District, vicinity of Belyaevka (46°25'N, 30°10'E), floodplain forest near Dniester River, 24 Juny 2008, V. Trach coll.; three females from *Agonum* sp., same data; sixteen females from *Agonum* sp., Ukraine, Odessa Region, Belyaevka District, vicinity of Troitskoe (46°32'N, 30°00'E), floodplain forest near Turunchuk River, 21 Mar. 2009, V. Trach coll.

Distribution — Belgium (Fain *et al.*, 1995).

Remarks — The species was previously known only from the type series from Belgium, which were described from carabids. *A. calathi* is new to the fauna of Ukraine.

***Antennoseius (s. str.) dungeri* Karg, 1965**

Material examined — thirty-seven females from *Harpalus* spp. and *Amara* spp., Ukraine, Odessa Region, Kiliya District, Zmeinyy Island (45°15'N, 30°12'E), 29 July 2005, V. Trach coll.; two females from *Zabrus tenebrioides* Goeze, 1777, Ukraine, Odessa Region, Ovidiopol District, vicinity of

Karolino-Bugaz (46°09'N, 30°33'E), 25 May 2007, V. Trach coll.; three females from *Harpalus* sp., Ukraine, Odessa Region, Odessa City (46°26'N, 30°40'E), park, Mar. 2009, V. Trach coll.; one female from *Amara* sp., Ukraine, Odessa Region, Ovidiopol District, vicinity of Roxolany (46°09'N, 30°33'E), steppe, 05 May 2009, V. Trach coll.; two females from undetermined Carabidae, Ukraine, Odessa Region, Belgorod-Dnestrovsk District, vicinity of Zatoka (46°01'N, 30°24'E), Black Sea Coast, 25 Apr. 2011, V. Trach coll.; three females from *Zabrus tenebrioides* Goeze, 1777, Ukraine, Odessa Region, Odessa City (46°27'N, 30°45'E), 10 Juny 2014, V. Trach coll.

Distribution — Central and North Europe, Ukraine (Donetsk and Lugansk Regions) (Karg, 1965, 1993; Sklyar, 2001; Kalúz, 2008; Trach, 2013).

Remarks — The species is known from soil-litter habitats and carabid beetles.

***Antennoseius (s. str.) masoviae* Sellnick, 1943**

Material examined — two females from *Harpalus* sp., Ukraine, Odessa Region, Kiliya District, Zmeinyy Island (45°15'N, 30°12'E), 29 July 2005, V. Trach coll.; two females from *Amara* sp., same data; six females from undetermined Carabidae, Ukraine, Crimea, Yalta City Municipality, vicinity of Yalta (44°31'N, 34°07'E), Crimean Mountains, 23 Aug. 2008, A. Khaustov coll.; one female from *Agonum* sp., Ukraine, Odessa Region, Belyaevka District, vicinity of Troitskoe (46°32'N, 30°00'E), floodplain forest near Turunchuk River, 21 Mar. 2009, V. Trach coll.; one female from *Pogonus* sp., Ukraine, Odessa Region, Kominternovo District, vicinity of Koshary (46°38'N, 31°09'E), steppe, 01 Apr. 2009, V. Trach coll.; eleven females from *Amara* sp., Ukraine, Odessa Region, Bolgrad District, vicinity of Krinichnoe (45°34'N, 28°41'E), steppe, Juny 2009, K. Dermenzhi coll.; two females from *Calathus* sp., Ukraine, Odessa Region, Podolsk District, Podolsk City (47°45'N, 29°31'E), 21 July 2010, Ye. Khalaim coll.

Distribution — Europe, Ukraine (Zakarpattia Region), Western Middle-East and Iran (Costa 1969; Bregetova, 1977c; Karg, 1993; Fain *et al.*,

1995; Haitlinger, 2008; Plumari, 2008; Kazemi and Moraza, 2013).

Remarks — The species is known from soil-litter habitats and carabid beetles.

***Antennoseius (s. str.) ponticus*
Tratsch and Makarova, 2008**

Material examined — fifteen females from *Harpalus* sp., Ukraine, Kherson Region, Tsyurupinsk District, vicinity of Radensk (46°33'N, 32°57'E), sandy steppe, 14 May 2001, A. Khaustov coll.; six females from undetermined Carabidae, Ukraine, Crimea, Yalta City Municipality, vicinity of Yalta (44°31'N, 34°07'E), Crimean Mountains, 23 Aug. 2008, A. Khaustov coll.; four females from *Harpalus* sp., Ukraine, Kherson Region, Tsyurupinsk District, vicinity of Radensk (46°33'N, 32°57'E), sandy steppe, 05 – 06 Juny 2010, V. Trach coll.; three females on *Calathus* sp., same data; one female on *Daptus* sp., same data; two females from *Harpalus* sp., Ukraine, Crimea, Chernomorskoe District, vicinity of Olenevka (45°22'N, 32°30'E), steppe, 01 May 2013, V. Trach coll.; three females on *Amara* sp., Ukraine, Vinnytsia Region, Haisyn District, vicinity of Gubnyk (48°34'N, 29°20'E), agrocenosis, 19 Juny 2016, V. Trach coll.; three females from *Harpalus distinguendus* (Duftschmid, 1812), same data and locality; forty-five females from *Harpalus* sp. and *Calathus* sp., same locality, pine forest, 20 Juny 2016, V. Trach coll.

Distribution — Ukraine (Odessa, Nikolaev and Lugansk Regions) (Trach and Makarova, 2008; Trach, 2013).

Remarks — The species is known from carabid beetles (and, putatively accidental, from leaf beetle *Chrysolina gypsophilae* (Küster, 1845)) and soil-litter habitats.

***Antennoseius (s. str.) pseudospinosus*
Eidberg, 1990**

Material examined — five females from *Badister* sp., Ukraine, Odessa Region, Berezovka District, vicinity of Berezovka (47°10'N, 30°56'E), floodplain forest near Tiligul River, 26 Mar. 2000, V. Trach coll.; three females from *Agonum* sp., same locality, 09 Mar.

2001, V. Trach coll.; two females from *Pterostichus* sp., same locality, 01 Apr. 2001, V. Trach coll.; nine females from *Agonum* sp., same locality, 16 Apr. 2002, V. Trach coll.; five females from *Chlaenius* sp., Ukraine, Odessa Region, Belyaevka District, vicinity of Belyaevka (46°25'N, 30°10'E), floodplain forest near Dniester River, 24 Juny 2008, V. Trach coll.; eighteen females from *Agonum* sp., same data; one female from *Agonum* sp., Ukraine, Odessa Region, Belyaevka District, vicinity of Troitskoe (46°32'N, 30°00'E), floodplain forest near Turunchuk River, 21 Mar. 2009, V. Trach coll.; twelve females from undetermined Carabidae, Ukraine, Crimea, Bahchisaray District, vicinity of Verhnyaya Kutuzovka (44°44'N, 34°20'E), pond of Kutuzovskoe Lake, 26 May 2010, A. Khaustov coll.; one female from *Bembidion* sp., Ukraine, Crimea, Simferopol District, vicinity of Lozovoe (44°54'N, 34°10'E), Salgir River valley, 01 May 2013, V. Trach coll.

Distribution — Ukraine (Crimea, Odessa and Zakarpattia Regions) (Eidberg, 1990).

Remarks — The species is known only from carabid beetles.

***Antennoseius (s. str.) sharonovi* Eidberg, 1989**

Material examined — two females from *Calathus fuscipes* (Goeze, 1777), Ukraine, Crimea, Yalta City Municipality, vicinity of Nikita (44°30'N, 34°14'E), 17 Oct. 2010, A. Khaustov coll.

Distribution — Ukraine (Crimea), Iran (Eidberg, 1989; Sklyar, 1994; Kazemi and Moraza, 2013).

Remarks — The species is known only from carabid beetles.

***Antennoseius (Vitzthumia)*
multisetus Eidberg, 2000**

Material examined — two females from undetermined Carabidae, Ukraine, Nikolaev Region, Berezanka District, vicinity of Koblevo (46°39'N, 31°11'E), salt-marsh on the coast of Tiligul Estuary, 19 May 2001, V. Trach coll.; eighteen females from *Harpalus* sp., Ukraine, Odessa Region, Kominternovo District, vicinity of Koshary (46°38'N, 31°09'E), salt-marsh on the coast of Tiligul Estuary,

01 Apr. 2009, V. Trach coll.; two females from *Pogonistes* sp., Ukraine, Odessa Region, Kominternovo District, vicinity of Korsuncy (46°35'N, 30°44'E), salt-marsh on the coast of Kuyalnik Estuary, 15 Mar. 2014, V. Trach coll.

Distribution — Ukraine (Crimea), Moldova, Russia (Eidelberg, 2000).

Remarks — The species is known only from carabid beetles.

Genus *Anystipalpus* Berlese, 1911

Remarks — The genus *Anystipalpus* includes five species. Currently, three species are known in Ukraine — *Anystipalpus livshitsi* (Eidelberg, 1989), *A. pericola* Berlese, 1911, *A. stepposus* Trach, 2012 (Eidelberg, 1989; Trach, 2012a, 2013). Mites of this genus reported only from carabid beetles and labidurid earwigs (Lindquist and Moraza, 2009).

Anystipalpus labiduricola Lindquist and Moraza, 2009

Material examined — four females from *Harpalus dispar splendens* (Gebler, 1829), Ukraine, Odessa Region, Kominternovo District, vicinity of Korsuncy (46°35'N, 30°44'E), salt-marsh on the coast of Kuyalnik Estuary, 15 Mar. 2014, V. Trach coll.

Distribution — Iran (Lindquist and Moraza, 2009).

Remarks — *A. labiduricola* was previously known only from the type series, which was described from labidurid earwigs. The species is new to the fauna of Europe and Ukraine.

Anystipalpus livshitsi (Eidelberg, 1989)

Material examined — two females from *Harpalus* sp., Ukraine, Odessa Region, Berezovka District, vicinity of Berezovka (47°11'N, 30°54'E), steppe, 11 May 2000, V. Trach coll.; five females from *Brachynus* sp., same locality, 30 Mar. 2001, V. Trach coll.; three females from *Poecilus* sp., Ukraine, Odessa Region, Razdelnaya District, vicinity of Maloe (46°44'N, 30°28'E), steppe, 08 Apr. 2001, V. Trach coll.; eight females from *Amara* sp., Ukraine, Kirovograd Region, Znamenka District, vicinity of

Bogdanovka (48°45'N, 32°32'E), 29 Apr. – 06 May 2001, V. Trach coll.; seven females from *Harpalus* sp., Ukraine, Nikolaev Region, Elanets District, vicinity of Novoalexandrovka (47°34'N, 32°00'E), steppe, 07 Apr. 2002, V. Trach coll.; one female from *Calosoma auropunctatum* Herbst, 1784, Ukraine, Kherson Region, Chaplynka District, vicinity of Askania-Nova (46°27'N, 33°52'E), 04 – 15 July 2002, V. Trach coll.; eight females from *Harpalus* sp., Ukraine, Odessa Region, Kiliya District, Zmeinyy Island (45°15'N, 30°12'E), 29 July 2005, V. Trach coll.; five females from *Amara* sp., same data; 9 females from *Harpalus distinguendus* (Duftschmid, 1812), Ukraine, Odessa Region, Razdelnaya District, vicinity of Kirovo (46°43'N, 30°15'E), field, 11 Aug. 2007, V. Trach coll.; one female from *Calathus halensis* (Schaller, 1783), same data; three females, from *Harpalus rufipes* (De Geer, 1774), same locality, 11 May 2008, V. Trach coll.; one female from *Cymindis* sp., Ukraine, Odessa Region, Kodyma District, vicinity of Alexandrovka (48°00'N, 29°16'E), steppe, 15 May 2010, V. Trach coll.; one female from *Harpalus distinguendus* (Duftschmid, 1812), Ukraine, Odessa Region, Odessa City (46°26'N, 30°46'E), park, 24 Mar. 2010, V. Trach coll.; one female from *Calathus* sp., Ukraine, Kherson Region, Kalanchak District, vicinity of Chervony Chaban (46°10'N, 33°34'E), steppe, 02 – 05 May 2011, V. Trach coll.; one female from *Brachynus* sp., same data; twenty-eight females from *Brachynus* sp., Ukraine, Nikolaev Region, Berezanka District, vicinity of Novofedorovka (46°46'N, 31°19'E), field, 16 July 2014, V. Trach coll.; two females from *Calathus distinguendus* Chaudoir, 1846, Ukraine, Odessa Region, Kominternovskoe District, vicinity of Lubopol (46°41'N, 31°08'E), steppe, 31 May 2015, O. Deli coll.; one female from *Zabrus tenebrioides* Goeze, 1777, same data.

Distribution — Ukraine (Crimea, Donetsk, Lugansk and Poltava Regions), Moldova, Kazakhstan, Iran (Eidelberg, 1989; Sklyar, 1994; Lindquist and Moraza, 2009; Trach, 2013).

Remarks — The species is known only from carabid beetles.

***Anystipalpus pericola* Berlese, 1911**

Material examined — one female from *Licinus cassideus* (Fabricius, 1792), Ukraine, Crimea, Yalta City Municipality, vicinity of Nikita (44°30'N, 34°14'E), 17 Oct. 2010, A. Khaustov coll.

Distribution — Italy, Ukraine (Crimea), Iran (Berlese, 1911; Eidelberg, 1989; Lindquist and Moraza, 2009).

Remarks — The species is known only from carabid beetles.

***Anystipalpus stepposus* Trach, 2012**

Material examined — one female from *Calathus fuscipes* (Goeze, 1777), Ukraine, Crimea, Yalta City Municipality, vicinity of Nikita (44°30'N, 34°14'E), 17 Oct. 2010, A. Khaustov coll.; two females from *Licinus cassideus* (Fabricius, 1792), same data; one female from *Zabrus tenebrioides* Goeze, 1777, Ukraine, Odessa Region, Bolgrad District, vicinity of Gorodnee (45°53'N, 28°51'E), wheat field, 24 June 2016, L. Nedelcheva coll.

Distribution — Ukraine (Lugansk Region) (Trach, 2012a, 2013).

Remarks — The species was previously known only from the type series from carabid beetles.

Family Laelapidae Berlese, 1892
Genus *Gaeolaelaps* Evans and Till, 1966

Remarks — The genus *Gaeolaelaps* Evans et Till, 1966 includes over 100 described species. Most species were described from soil and litter, but some species were collected from nests of vertebrates and from arthropods (or their nests), including mygalomorph spiders, millipedes, cockroaches, termites, carabid, passalid, cerambycid, scarabaeid beetles and ants (Bregetova, 1977d; Karg, 1993; Beaulieu, 2009; Trach, 2012b, 2016; Kazemi *et al.*, 2014). Only four species of *Gaeolaelaps* were previously encountered in Europe on carabids — *G. nolli* (Karg, 1962) on *Agonum fuliginosum* (Panzer, 1809) in Belgium, *G. aculeifer* (Canestrini, 1884) on *Carabus intricatus* Linnaeus, 1961 in Poland, *G. carabidophilus* Trach, 2012 on *Stenolophus mixtus* (Herbst, 1784) and *G. khaustovi* Trach, 2016 on *Bembidion* sp. in Ukraine (Fain *et al.*, 1995; Haitlinger, 2008; Trach, 2012b, 2016).

***Gaeolaelaps similisetae* (Karg, 1965)**

Material examined — fourteen females from *Bembidion* sp., Ukraine, Crimea, Simferopol District, vicinity of Lozovoe (44°54'N, 34°10'E), Salgir River valley, 01 May 2013, V. Trach coll.

Distribution — Europe (Karg, 1965, 1993).

Remarks — The species was previously known only from soil-litter habitats. *G. similisetae* is new to the fauna of Ukraine.

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