Eutarsopolipus Davidsoni N. Sp. (Acari: Podapolipidae) From Chlaenius Sericeus (Coleoptera: Carabidae) From Ingham County, Michigan, and Redescription of Male Eutarsopolipus Regenfussi

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EUTARSOPOLIPUS DAVIDSONI N. SP. (ACARI: PODAPOLIPIDAE) FROM CHLAENIUS SERICEUS (COLEOPTERA: CARABIDAE) FROM INGHAM COUNTY, MICHIGAN, AND REDDESCRIPTION OF MALE EUTARSOPOLIPUS REGENFUSSI

Robert W. Husband

ABSTRACT

A new species of podapolipid mite from Michigan, Eutarsopolipus davidsoni (Acari: Podapolipidae) is described, illustrated and compared with related species of Eutarsopolipus in the Myzus group. Eutarsopolipus davidsoni is an ectoparasite of Chlaenius sericeus (Coleoptera: Carabidae). Keys to genera and groups of podapolipid mite parasites of Carabidae and keys to 11 species in the Myzus group of Eutarsopolipus are provided. The male stage of E. regenfussi Husband and Swihart 1986 is redescribed from specimens taken from the type host, Chlaenius pennsylvanicus.

Mites in the family Podapolipidae (Acari: Tarsonemini) are highly specialized ecto- and endoparasites of insects of the orders Blattaria, Orthoptera, Heteroptera, Hymenoptera and, especially, Coleoptera. Regenfuss (1968) provided a pioneer study of the family Podapolipidae. Eutarsopolipus regenfussi Husband and Swihart 1986 was described from Chlaenius pennsylvanicus (L.) and C. sericeus Forster collected at the University of Michigan Biological Station at Douglas Lake, Cheboygan County by P. W. Fattig in July and August 1915. The holotype of the adult female of E. regenfussi, removed from C. pennsylvanicus, differs from adult female Eutarsopolipus sp. taken from Chlaenius sericeus from the same locality. By comparison of holotype and associated paratypes from the same host, locality and date collected, it was discovered that the male of E. regenfussi illustrated in Husband and Swihart (1986) is not E. regenfussi but rather a new species, which is described here.

METHODS AND MATERIALS

Chlaenius pennsylvanicus and C. sericeus from various localities borrowed from the Carnegie Museum of Natural History, Pittsburgh, Pennsylvania, the Entomology Museum, Michigan State University, East Lansing, Michigan and the Museum of Zoology, University of Michigan, Ann Arbor, Michigan were examined for podapolipid mites. Type specimens of Eutarsopolipus regenfussi from Chlaenius pennsylvanicus from the U. S. National Museum of Natural History, the Museum of Zoology, University of Michigan

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and the Zoological Institute of the University of Hamburg, Germany were examined. Specimens of *Eutarsopolipus* sp. from *Chlaenius sericeus* from the type locality for *E. regenfussi* from the Zoological Institute of the University of Hamburg, Germany and *Eutarsopolipus* sp. collected in New York were studied. The technique for removing mites from museum specimens is described in Husband and Dastych (1998).

Measurements were taken with the aid of a Zeiss compound microscope with an ocular micrometer. All measurements are in micrometers. Setae that are no longer than setal sockets are listed as microsetae (m). The terminology used here follows Lindquist (1986). Often long setae are obscured, bent, broken or at an angle which makes measurement difficult. Setae are at least as long as indicated.

**Family Podapolipidae Ewing, 1922**

Genus *Eutarsopolipus* (Berlese 1913)

*Eutarsopolipus (Tarsopolipus) lagenaeformis* (Berlese 1911)

The genus *Eutarsopolipus* is characterized by: lack of femoral II, III setae in all instars, males with a posterior genital capsule and 3 pairs of legs; females with 3 pairs of legs, with or without genu I, II, III setae, plates C and D with filiform setae; larval females with long setae *h*_1, shorter adjacent setae *h*_2.

**Eutarsopolipus davidsoni, new species**

Figs. 1-3

**Adult Female** (Fig. 1). Gnathosoma length 36–45, width 39–53. Palp length 12–15; cheliceral stylet length 32–35, pharynx width 11–15, dorsal gnathosomal setae 7–11, ventral setae m, distance between ventral setae 17–18. Stigmata and trachea evident.


Venter with apodemes 1 moderately developed, meeting sternal apodeme medially; apodemes 2 not extending to sternal apodeme. Coxal setae thin, 1a m, 2a m, 3a m–3, 3b 3–6.

**Legs.** Ambulacrum I with well developed claw, ambulaca II, III with small claws. Tarsus I solenidion φ 3–4. Tibia I solenidion φ 4–6, seta *k* 2–5. Tibiae I, II, III setae *d* 13–15, 3–4, 2–3 respectively. Leg setation for femora, genua, tibiae and tarsi I. II. III is respectively: 2-0-7-8, 0-0-4-6, 0-0-4-5.

**Larval Female** (Fig. 2). Gnathosoma length 28–37, width 24–29. Palp length 7–12; cheliceral stylet length 24–29, pharynx width 7–8, dorsal gnathosomal setae 13–19, ventral setae m, distance between ventral setae 9–12.

Figure 1. *Eutarsopolipus davidsoni* n. sp., adult female. A. Dorsal aspect. B. Ventral (left) and dorsal aspects of proterosoma.

11–20, width 11–15; setae $h_1$ 75, setae $h_2$ 17–25. Venter with apodemes 1 moderately developed, meeting sternal apodeme medially; apodemes 2 not extending to sternal apodeme. Coxal setae thin, $1a$ m, $2a$ m, $3a$ 3–4, $3b$ 5–7.


**Male** (Fig. 3). Gnathosoma length 28–30, width 30–32. Palp length 8–10; cheliceral stylet length 17–22, pharynx width 7, dorsal gnathosomal setae 8–12, ventral setae $m$, distance between ventral setae 9–12.

**Idiosoma.** Length 136–157, width 99–102. Prodorsal plate length 55–63, width 90–100, setae $v_1$ m, $v_2$ m, $sc_2$ 25–33. Distance between setae $v_1$ 19–23, $v_2$ lateral to a line connecting $v_1$ and $sc_2$. Plates C/D fused, length CD 58–60, width 100–102; setae $c_1$ m, setae $c_2$ m, setae $d$ m. Plate EF length 20–23, width 32; setae $e$ 13–15. Plate H length 14–15, width 25–30; setae $h_1$ 240, setae $h_2$ m. Venter with apodemes 1 moderately developed, meeting sternal apodeme medially; apodemes 2 not extending to sternal apodeme. Coxal setae thin, $1a$ m, $2a$ m, $3a$ m, $3b$ 3–5. Genital capsule length 23–25, width 20.

Figures 3 and 4. *Eutarsopolipus davidsoni* n. sp., male, ventral (left) and dorsal aspects (3). *Eutarsopolipus regenfussi* Husband and Swihart, male, ventral (left) and dorsal aspects (4).

RWH24699-45. Allotype, ♂ (RWH24699-46) with same data as holotype deposited with the holotype. Paratypes: 1 adult ♀, 3 ♂♂, 13 larval ♀♀, same data as holotype; 2 adult ♀♀, 13 ♂♂, 3 larval ♀♀. Douglas Lake, Cheboygan Co., Michigan, collected 10 July 1915 by P.W. Fattig; 1 adult ♀, 1 ♂, 1 larval ♀ Duncan Bay, Cheboygan Co., Michigan, collected July 1962; 1 adult ♀, Port
Sanilac, Sanilac Co., Michigan, collected 20 June 1966 by C. Brivio; 1 adult ♀, 2 ♂, 2 larval ♀♀, Fine Lake, Barry Co., Michigan, collected 21 May 1932; 1 adult ♂, 1 larval ♀, Taquamenon Falls, Luce Co., Michigan, collected July 1962; 1 adult ♀, 1 ♂, 1 larval ♀, E. of Memphis, Macomb Co., Michigan, collected 21 April 1967; 1 adult ♀, 1 larval ♀, E. of Memphis, Macomb Co., Michigan, collected 4 May 1963 by C. Brivio. Additional mites with same data as paratypes are contained in vials in the Acarology Collection, Adrian College, Adrian, Michigan, 49221, U.S.A.

Deposition of types. Two larval ♀♀ (RWH190899-11, RWH24699-47) with same data as holotype deposited with the holotype; ♂ (RWH190899-3), larval ♀ (RWH190899-6), same data as holotype, to the U. S. National Museum of Natural History, Washington, D.C.; ♂ (RWH190899-4), larval ♀ (RWH190899-8), with same data as holotype, to the Museum of Zoology, University of Michigan, Ann Arbor, Michigan, U.S.A.; adult ♀ (RWH24699-16), ♂ (RWH190899-16), larval ♀ (RWH190899-14) to the Carnegie Museum of Natural History, Pittsburgh, Pennsylvania; adult ♀ (A30/1985-448), 12 ♂, ♂, larval ♀ (RWH190899-9) to the Zoological Institute, University of Hamburg, Hamburg, Germany; adult ♀ (RWH190899-2), ♂ (RWH190899-1) and larval ♀ (RWH24699-48) with same data as holotype in the Acarology Collection, Adrian College, Adrian, Michigan, 49221, U.S.A. The balance of type specimens are deposited with the holotype.

Etymology. The species is named for Robert L. Davidson of the Carnegie Museum of Natural History, Pittsburgh, Pennsylvania, specialist in the carabid genus Chlaenius, in tribute to his cooperation in the study of padorpolipid mites from Carabidae.

Diagnosis. In contrast to E. regenfussi and other Eutarsopolipus spp. in the myzus group, adult female Eutarsopolipus davidsoni and E. latus have divided plates C and D and small ambulacral II, III claws. E. latus females are widest anterior to plates C while E. davidsoni females are elongate and widest at plate EF. Cheliceral stylets of E. davidsoni and E. latus are 32–35 (Table 1). The genital of male E. davidsoni is elongate with a narrow distal portion in contrast to the broader genital plate of male E. regenfussi. Lengths of cheliceral stylets of larval females in E. davidsoni, E. regenfussi and E. latus are 24–29 in contrast to 37 for E. tomentosi. It is difficult to separate larval Eutarsopolipus species in the Myzus group.

Redescription of male Eutarsopolipus regenfussi

Male (Fig. 4). Gnathosoma length 24, width 27. Palp length 8; cheliceral stylet length 18, pharynx width 5, dorsal gnathosomal setae 6, ventral setae 1.

Idiosoma. Length 140, width 190. Prodorsal plate length 60, width 88, setae v₁2, v₂3, sc₂ 42. Distance between setae v₁ 18, v₂ lateral to a line connecting v₁ and sc₂. Setae c₁3, c₂3, d 3 and e m. Genital capsule posterior, length 22, width 22, sides slightly concave.

Venter with apodemes I moderately developed, meeting sternal apodeme medially; apodemes 2 not extending to sternal apodeme. Coxal setae 1α m, 2α m, 3α m, 3β 3.


Diagnosis. The genital capsule of E. regenfussi from Chlaenius pennisylvanicus is no longer than broad with a wide distal portion. The genital cap-
Table 1. Measurements of adult females of American *Eutarsopolipus* in the *Myzus* group from carabid hosts of the genus *Chlaenius* spp.: *E. davidsoni, E. latus, E. regenfussi* and *E. tomentosi*. All measurements are in micrometers. Microsetae (m) are not longer than the diameter of the acetabulum.

<table>
<thead>
<tr>
<th>Character</th>
<th><em>E. davidsoni</em></th>
<th><em>E. latus</em></th>
<th><em>E. regenfussi</em></th>
<th><em>E. tomentosi</em></th>
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<tbody>
<tr>
<td><strong>ADULT FEMALES</strong></td>
<td></td>
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<tr>
<td>Idiosomal length</td>
<td>320–880</td>
<td>250–400</td>
<td>210–605</td>
<td>233</td>
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<tr>
<td>Idiosomal width</td>
<td>205–400</td>
<td>170–350</td>
<td>130–398</td>
<td>170</td>
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<tr>
<td>Pharynx width</td>
<td>11–15</td>
<td>13</td>
<td>13–15</td>
<td>21</td>
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<tr>
<td>Setae $h_1$</td>
<td>3–4</td>
<td>m</td>
<td>11–16</td>
<td>8</td>
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<td>7–11</td>
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<td>7</td>
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<td>Femur I $I'$</td>
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<td>5</td>
<td>10–12</td>
<td>3</td>
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<tr>
<td>Tibia I $d$</td>
<td>13–15</td>
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<td>28–41</td>
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<td><strong>MALES</strong></td>
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<tr>
<td>Idiosomal length</td>
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<td>140</td>
<td>154–162</td>
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<td>Idiosomal width</td>
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<td>6</td>
<td>8–9</td>
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<tr>
<td>Setae $sc_2$</td>
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<td>Tibia I $d$</td>
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<td>Genit. cap. Width</td>
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<td>22–25</td>
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<td><strong>LARVAL FEMALES</strong></td>
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<td>Idiosomal length</td>
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<td>130–165</td>
<td>125–230</td>
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<tr>
<td>Idiosomal width</td>
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<td>88–130</td>
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<td>17</td>
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<tr>
<td>Coxal seta 3a</td>
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<td>4–7</td>
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<tr>
<td>Femur I $I'$</td>
<td>3</td>
<td>4–5</td>
<td>2–5</td>
<td>m</td>
</tr>
</tbody>
</table>

sule of *E. davidsoni* from *C. sericeus* is longer and has a narrower distal portion.

**DISCUSSION**

*Dorsipes, Eutarsopolipus, Ovacarus* and *Regenpolipus* are the four genera associated with the beetle family Carabidae. Mites in these genera are not found as parasites of other families of beetles. Regenfuss (1968) divided the genus *Dorsipes* into 3 groups: *Dorsipes, Platysmae* and *Inflatus*. He divided the genus *Eutarsopolipus* into 7 groups: *Lagenaeformis, Desani, Myzus, Pterostichi, Biunguis, Acanthomus*, and *Stammeri*. The genus *Ovacarus* was described by Stannard and Vaishampayan (1970) and *Regenpolipus* was described by Husband (1986). Husband (1996) added a primitive group, *Ochoai* and Husband and Macfarlane (1999) added *Secundus and*
Megacheli groups. The following key is based on adult females and follows Regenfuss (1968) in part.

KEY TO GENERA OF FEMALE PODAPOLIPIDAE FROM CARABID BEETLES AND GROUPS OF DORSIPES AND EUTARSOPOLIPUS

1. Prodorsal plate and plates C and D with filiform setae ................................................ 2
   Prodorsal plate and plates C and D with thick setae,
   3–7 μm in length ....................................................................................................................... genus Ovacarus

2. Femora II, III setae present .................................................................................. genus Dorsipes
   Femora II, III setae not present .............................................................................................. 5

3. Setae f not present ................................................................................................. 4
   Setae f present .................................................................................................................. Dorsipes

4. Ambulacral II, III claws thin, tarsus II solenidion u present ..................................... Platyssae
   Ambulacral II, III claws strong, tarsus II solenidion u not present ...................................... Inflatus

5. Coxal setae 3a present .......................................................................................... genus Eutarsopolipus
   Coxal setae 3a not present ................................................................................................. genus Regenpolipus

6. Setae present on each of genua I, II, III ..................................................................................... 7
   Setae not present on each of genua I, II, III ........................................................................ 9

7. Femur I seta v present ......................................................................................................... 8
   Femur I seta v not present .................................................................................................... Stammeri

8. Setae v1 present, setae c2 not present, no ambulacral II, III claws ................................................ Acanthomus
   Setae v1 prominent, setae c2 present, strong ambulacral II, III claws ........................................... Ochoai

9. Genua I with setae, genua II, III without setae ........................................................................ 10
   Genua I, II, III without setae ............................................................................................. 11

10. Femur I seta v2 present ........................................................................................................ Secundus
    Femur I seta v2 not present ................................................................................................ Megacheli

11. Stigmata conspicuous .................................................................................................... 12
    Stigmata not conspicuous, with strong claws (except E. inermis) ........................................ Pterostichi

12. Ambulacra I, II, III with strong claws (except E. poecili) ...................................................... 13
    Ambulacra I, II, III without claws ........................................................................................ Biunguis

13. Tarsus II solenidion w present .............................................................................................. 14
    Tarsus II solenidion w not present ......................................................................................... Lagenaeformis

14. Cheliceral stylets 62 μm or longer (68–138) ........................................................................ Desani
    Cheliceral stylets less than 62 μm (30–60) ............................................................................... Myzus

Eutarsopolipus davidsoni is in the Myzus group. The group as defined by Regenfuss (1968) with modification for added species has the following characteristics: females with stigmata, without femur I v”, without genua I, II, III setae, with setae h1 (may be microsetae to 60 μm), ambulacral I claw strong (except E. poecili), ambulacral II, III claws strong (except E. latus, E. davidsoni), plates C and D not divided (except E. latus, E. davidsoni), cheliceral stylets 30–60 μm, femur I seta l’ longer than 10μm (except E. latus, E. davidsoni, E. tomentosi); males with genital capsule concave laterally, with weak or no ambulacral II, III claws; larval females with setae h1 not widely separated, setae h0 15–43 μm, with weak or no ambulacral II, III claws.

Initially, Regenfuss (1968) included 5 species from Pterostichi spp. collected in Germany: E. myzus, E. abdomenis, E. squamorum, E. thoracis, and E. poecili. E. quebecensis Husband 1998 is also from Pterostichus sp. The remaining species are from Chlaenius spp.: E. latus Regenfuss 1974, E. cauda-
KEY TO ADULT FEMALES OF THE
MYZUS GROUP OF EUTARSOPOLIPUS

1. Propodosoma does not cover gnathosoma, with strong ambulacrum I claw................................................................. 2
Propodosoma covers gnathosoma, without ambulacrum I claw...E. poecili

2. Without wrinkled posterior lobes .............................................................................................................................. 3
With wrinkled posterior lobes................................................. E. quebecensis

3. Plate C not entire ........................................................................................................................ 4
Plate C entire ................................................................................................. 5

4. Setae $h_1$ microsetae, femur I' 5, idiosoma widest anterior to the plane ... of plate D.................................................. E. latus 
Setae $h_1 3-4$, femur I' m-3, idiosoma widest posterior to the plane of plate D ............................................ E. davidsoni

5. Idiosoma not tear-drop shape ............................................................................................................................. 6
Idiosoma tear-drop shaped.................................................... E. thoracis

6. Idiosoma elangate, with lateral bulges near plate C ............................................................................................... 7
Idiosoma elongate, without lateral bulges ......................................................................................................................... 9

7. Idiosoma broadest anterior to the plane of plate D ................................................................................................. 8
Idiosoma broadest near the plane of plate D............................. E. squamorum

8. Idiosoma expands laterally caudal to the posterior margin of plate EF ............................................................................. E. myzus
Idiosoma lateral margins parallel posterior to the posterior margin of plate EF ......................................................... E. abdominis

9. Cheliceral stylets not longer than 50 $\mu$m .................................................................................................................. 10 
Cheliceral stylets longer than 50 $\mu$m (60) ................................................. E. caudatus

10. Femur I' longer than 10 $\mu$m .............................................................................................................................. E. regenfussi
Femur I' not longer than 5 $\mu$m ................................................. E. tomentosi

ACKNOWLEDGMENTS

LITERATURE CITED


