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Robert W. Husband
Adrian College

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

Robert W. Husband¹

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

¹Biology Department, Adrian College, Adrian, MI 49221, E-Mail rhusband@adrian.adrian.edu.

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* from *Chlaenius* 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.

Idiosoma. Length 320–880, width 205–400. Prodorsal plate length 62–70, width 155–165, setae v_1 m, v_2 m-3, sc_2 8–15. Distance between setae v_1 21–30, v_2 lateral to a line connecting v_1 and sc_2 . Plate C divided, length 36–45, width 45–58; setae c_1 m-3, setae c_2 m-3. Plate D divided, length 26–35, width 40–60; setae d 2–3. Plate EF not clear; setae e 2–3. Plate H length 9, width 24; setae h_1 3–4.

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, ambulacra II, III with small claws. Tarsus I solenidion ω 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.

Idiosoma. Length 131–190, width 100–169. Prodorsal plate length 43–45, width 75–79, setae v_1 3–4, v_2 3–4, sc_2 40–42. Distance between setae v_1 14–17, v_2 lateral to a line connecting v_1 and sc_2 . Setae c_1 2–4, setae c_2 3–5, setae d 3–4. Plate EF length 25–32, width 25–50; setae e 2–4. Plate H length

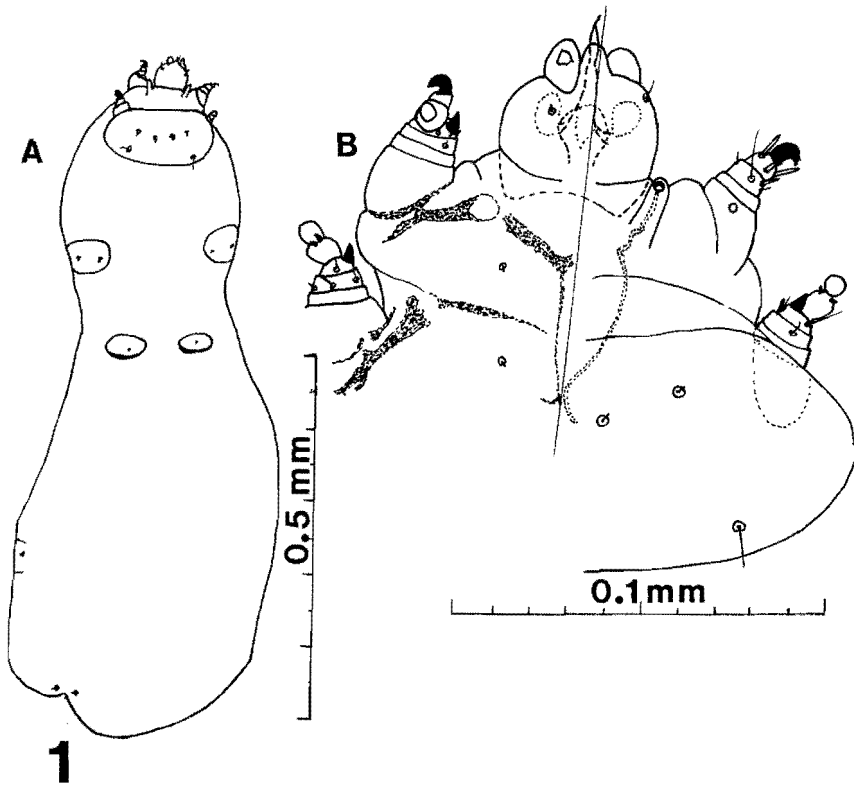


Figure 1. *Eutarsopolipus davidsoni* n. sp., adult female. A. Dorsal aspect. B. Ventral (left) and dorsal aspects of proterosoma.

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.

Legs. Ambulacrum I with 2 small claws 4. Ambulacra II, III without claws. Tarsus I solenidion ϕ 3–4. Tibia I solenidion ϕ 4, seta k 2–3. Tibiae I, II, III setae d 45, 4–5, 5–7 respectively. Leg setation as in adult female.

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.

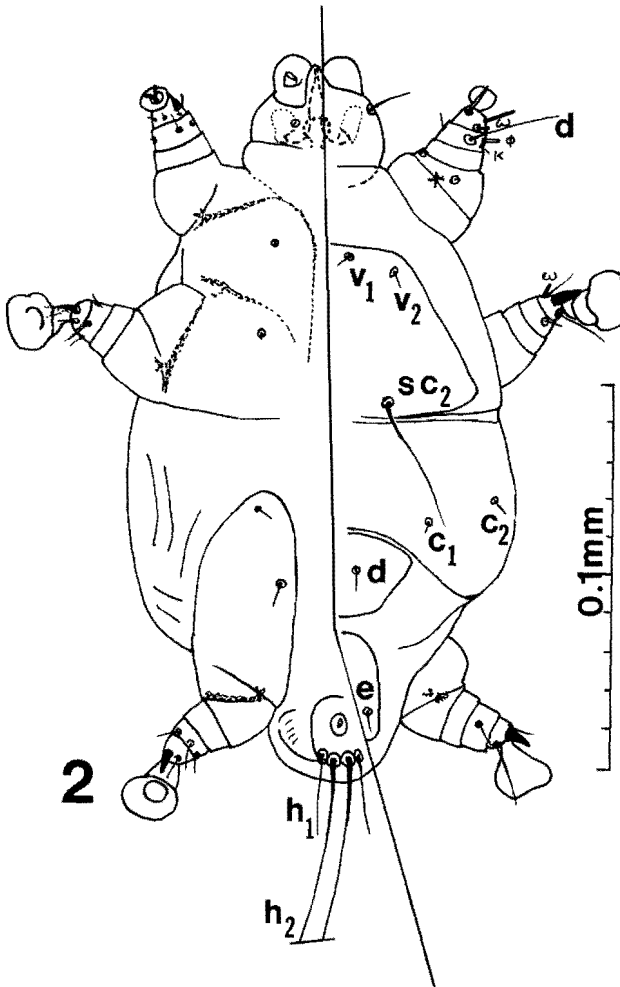
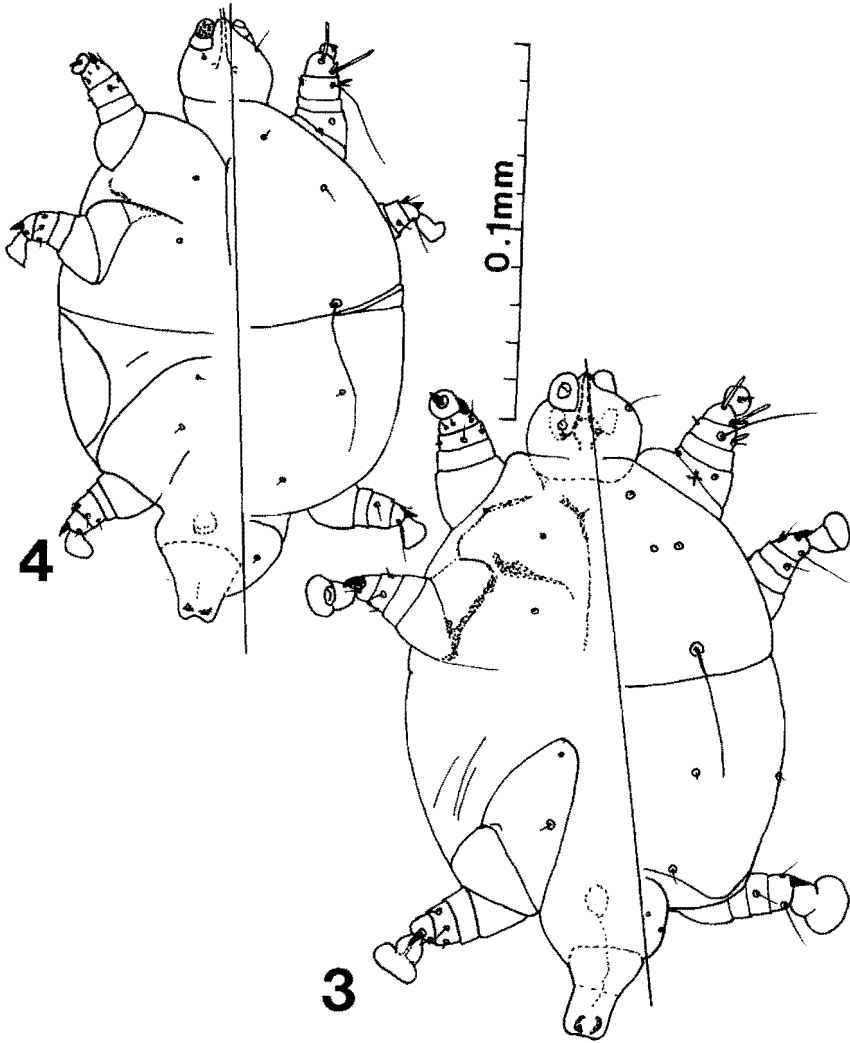


Figure 2. *Eutarsopolipus davidsoni* n. sp., larval female, ventral (left) and dorsal aspects.

Legs. Ambulacrum I with a small claw 5–6. Ambulacra II, III without claws. Tarsus I solenidion ω 3–5. Tibia I solenidion ϕ 5, seta *k* 3–4. Tibiae I, II, III setae *d* 20–24, 5–6, 4–5 respectively. Leg setation as in adult female.

Type data. Holotype ♀ from Meridian Township, T4N, R1W, S4, Ingham County, Michigan from under the elytra of *Chlaenius sericeus* Forster, (Carabidae), 8 May 1979, collected by G. A. Dunn. Deposited in the Entomology Museum, Michigan State University, East Lansing, MI, U.S.A., Type No.



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 ♂, 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 podapolipid 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 plate 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. tomentosus*. 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 m.

Idiosoma. Length 140, width 190. Prodorsal plate length 60, width 88, setae v_1 2, v_2 3, sc_2 42. Distance between setae v_1 18, v_2 lateral to a line connecting v_1 and sc_2 . Setae c_1 3, c_2 3, d 3 and e m. Genital capsule posterior, length 22, width 22, sides slightly concave.

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

Legs. Ambulacrum I with a small claw 5, ambulacra II, III with no claws. Tarsus I solenidion 0 bulbous 3. Tibia I solenidion 0 3, seta k 2. Tibiae I, II, III setae d 28, 8, 8 respectively.

Diagnosis. The genital capsule of *E. regenfussi* from *Chlaenius pennsylvanicus* 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. tomentosus*. All measurements are in micrometers. Microsetae (m) are not longer than the diameter of the acetabulum.

Character	<i>E. davidsoni</i>	<i>E. latus</i>	<i>E. regenfussi</i>	<i>E. tomentosus</i>
ADULT FEMALES				
Idiosomal length	320-880	250-400	210-605	233
Idiosomal width	205-400	170-350	130-398	170
Cheliceral stylets	32-35	32-35	43-48	46
Pharynx width	11-15	13	13-15	21
Setae h_1	3-4	m	11-16	8
Dorsal gnath. seta	7-11	5	15-23	7
Femur I l'	m-3	5	10-12	3
Tibia I d	13-15	12	28-41	24
MALES				
Idiosomal length	136-157	144	140	154-162
Idiosomal width	99-102	107	190	103-115
Cheliceral stylets	17-22	21	18	22-23
Dorsal gnath. setae	8-12	10	6	8-9
Setae sc_2	25-33	27	42	42
Tibia I d	20-24	22	28	25
Genit. cap. Length	23-25	21	22	19-22
Genit. cap. Width	20	25	22	22-25
LARVAL FEMALES				
Idiosomal length	131-190	130-165	125-230	-
Idiosomal width	100-169	93-105	88-130	-
Cheliceral stylets	24-29	25-27	25-28	37
Dorsal gnath. setae	13-19	13-17	10-12	17
Setae h_2	17-25	27-29	19-27	28
Coxal seta $3a$	3-4	3-4	4-7	7
Femur I l'	3	4-5	2-5	m

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 BEE-
TLES 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*..3
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 \bar{u} present *Platysmae*
Ambulacral II, III claws strong, tarsus II solenidion \bar{u}
not present *Inflatus*
5. Coxal setae *3a* present genus *Eutarsopolipus*..6
Coxal setae *3a* not present genus *Regenpolipus*
6. Setae present on each of genera I, II, III 7
Setae not present on each of genera I, II, III 9
7. Femur I seta *v'* present 8
Femur I seta *v'* not present *Stammeri*
8. Setae *v*₁ vestigial, setae *c*₂ not present, no ambulacral II,
III claws *Acanthomus*
Setae *v*₁ prominent, setae *c*₂ present, strong ambulacral II,
III claws *Ochoai*
9. Genua I with setae, genera II, III without setae 10
Genua I, II, III without setae 11
10. Femur I seta *v*₂ not present *Secundus*
Femur I seta *v*₂ 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 \bar{o} present 14
Tarsus II solenidion \bar{o} 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 characters: females with stigmata, without femur I *v''*, without genua I, II, III setae, with setae *h*₁ (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 10 μm (except *E. latus*, *E. davidsoni*, *E. tomentosii*); males with genital capsule concave laterally, with weak or no ambulacral II, III claws; larval females with setae *h*₁ not widely separated, setae *h*₂ 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. abdominis*, *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-*

tus Regenfuss 1974, *E. regenfussi* Husband and Swihart 1986, *E. tomoentosi* Husband and Dastych 1999 and *E. davidsoni* described herein. The following key is based in part on Regenfuss (1968). Only adult female instars are known for all species.

KEY TO ADULT FEMALES OF THE
MYZUS GROUP OF *EUTARSOPOLIPUS*

1. Propodosoma does not cover gnathosoma, with strong ambulacrum I claw2
Propodosoma covers gnathosoma, without ambulacrum I claw*E. poecili*
2. Without wrinkled posterior lobes3
With wrinkled posterior lobes*E. quebecensis*
3. Plate C not entire4
Plate C entire5
4. Setae h_1 microsetae, femur I l' 5, idiosoma widest anterior to the plane ...
of plate D*E. latus*
Setae h_1 3-4, femur I l' m-3, idiosoma widest posterior to
the plane of plate D*E. davidsoni*
5. Idiosoma not tear-drop shape6
Idiosoma tear-drop shaped*E. thoracis*
6. Idiosoma elangate, with lateral bulges near plate C7
Idiosoma elongate, without lateral bulges9
7. Idiosoma broadest anterior to the plane of plate D8
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 μ m10
Cheliceral stylets longer than 50 μ m (60)*E. caudatus*
10. Femur I l' longer than 10 μ m*E. regenfussi*
Femur I l' not longer than 5 μ m*E. tomentosi*

Studies of *Eutarsopolipus* spp. from *Chlaenius* spp. and other carabid hosts are in progress. Since less than 1000 of the 25,000 species of carabids have been examined for podapolipid mites, the potential for additional discoveries and increased understanding of the podapolipid mites from carabid beetles is promising.

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LITERATURE CITED

- Berlese, A. 1911. *Acarorum species novae quindecim*. Redia 7: 249-435.
- Berlese, A. 1913. *Acari nuovi*. Redia 9: 27-87.
- Ewing, H. E. 1922. Studies on the taxonomy and biology of tarsonemid mites together with a note on the transformation of *Acarapis (Tarsonemus) woodi* Renzi (Acarina). Can. Entomol. 54: 104-113.
- Husband, R. W. 1986. New taxa of Podapolipidae (Acarina) from S. African Coleoptera: result of the Namaqualand-Namibia expedition of the King Leopold III Foundation for the exploration and protection of nature (1980). Bull. Inst. R. Sci. Nat. Belg.: Entomologie 56: 5-14.
- Husband, R.W. and H. Dastych. 1998. A new species of *Eutarsopolipus* (Acari: Podapolipidae) from *Chlaenius sericeus* Frost (Coleoptera: Carabidae) from Athens, Georgia, U.S.A. Entomol. Mitt. Zool. Mus. Hamburg 12: 317-326.
- Husband, R.W. and D. Macfarlane. 1999. Two new species of *Eutarsopolipus* (Acari: Podapolipidae) from *Catadromus lacordairi* (Coleoptera: Carabidae) from Australia. Internat. J. Acarol. 25: 297-308.
- Husband, R. W. and Cheryl D. Swihart. 1986. A new species of mite (Acari: Podapolipidae) from a Michigan carabid beetle, *Chlaenius pennsylvanicus*. Great Lakes Entomol. 19: 107-113.
- Lindquist, E. E. 1986. The world genera of Tarsonemidae (Acari: Heterostigmata): a morphological, phylogenetic, and systematic revision with reclassification of family group taxa in Heterostigmata. Mem. Entomol. Soc. Can. 136: 1-517.
- Regenfuss, H. 1968. *Untersuchungen zur Morphologie, Systematik und Ökologie der Podapolipidae* (Acarina: Tarsonemini). Z. Wiss. Zool. 177: 183-282.
- Regenfuss, H. 1974. *Neue ektoparasitische Arten der Familie Podapolipidae* Acari: Tarsonemini von Carabiden. Mitt. Hamburg Zool. Mus. Inst. 71: 147-163.
- Stannard, L. J. and S. M. Vaishampayan. 1971. *Ovacarus clivinae*, new genus and species (Acarina: Podapolipidae), an endoparasite of the slender seedcorn beetle. Ann. Entomol. Soc. Amer. 64: 887-890.