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Robert W. Husband  
*Adrian College*

David O. Husband

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***Eutarsopolipus hemistylus* sp. nov. (Acari: Podapolipidae),  
Subelytral Parasite of *Chlaenius prasinus* Dejean  
(Coleoptera: Carabidae) from Central and Eastern USA**

Robert W. Husband<sup>1</sup> and David O. Husband<sup>2</sup>

**Abstract**

*Eutarsopolipus hemistylus* sp. nov. (Acari: Podapolipidae), subelytral, parasite of *Chlaenius prasinus* Dejean, 1826 (Coleoptera: Carabidae), is described from Illinois, Ohio, Missouri, Kentucky, North Carolina and Georgia, USA. *E. hemistylus* is compared with *E. americanus* Husband and Husband 2013 described from the same host, *C. prasinus*, collected in Michigan and Missouri. Species in the myzus group of *Eutarsopolipus* that parasitize beetle species of the genera *Chlaenius*, *Poecilus*, *Scarites* and *Diplocheila* are noted. Including a species from Japan currently under study, *E. hemistylus* is one of 8 species in the myzus group with adult females with stylets exceeding 43 micrometers but less than 90 micrometers.

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Mites in the family Podapolipidae (Acari: Tarsonemina) are all specialized haemolymph-feeding parasites of five orders of insects: Blattodea, Heteroptera, Hymenoptera, Orthoptera and especially Coleoptera. Regenfuss (1968) placed 18 species in the genus *Eutarsopolipus*, all parasites of the beetle family Carabidae, in seven groups based on apomorphic and other characters. Keys to adult females of 18 species of *Eutarsopolipus* in the myzus group of *Eutarsopolipus* and a discussion of the myzus group were presented by Husband and Kurosa (2013). The purpose of this paper is to describe a new species of *Eutarsopolipus* in the myzus group that is parasitic on *Chlaenius prasinus* Dejean (Coleoptera: Carabidae) in six states in central and eastern U.S.A., compare the species with *E. americanus* that occurs on the same host in the central U.S.A. and compare the species with previously described species in the myzus group.

**Methods**

Nine of 32 specimens of *C. prasinus* borrowed from the University of Michigan Museum of Zoology by the senior author were parasitized by podapolipid mites. Podapolipid mites with adult females with stylets 47-50 micrometers were removed from beetles collected in Carter County, Missouri; Inglebrook, Illinois; Hamilton Co., Ohio; Henderson Co., Kentucky; Moore Co., North Carolina and Floyd Co., Georgia. Mites were mounted in modified Hoyer's medium. Measurements were taken with the aid of a Zeiss compound phase contrast microscope with an ocular micrometer. Setae no longer than the diameter of setal acetabulae are listed as microsetae (m). Setae represented by acetabulae without setal remnants are listed as vestigials (v). Terminology follows Lindquist (1986). Long setae are often bent, obscured, broken or at an angle that makes measurement difficult. Setae are at least as long as indicated.

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<sup>1</sup>Biology Department, Adrian College, Adrian, Michigan 49221, U.S.A. (e-mail: husbandadrian@aol.com).

<sup>2</sup>346 Jamacha, Apartment 61, El Cajon, CA, 92019, U.S.A.

Abbreviations for institutions cited are: National Museum of Nature and Science, Tokyo, Japan (NSMT); National Museum of Natural History, Washington, D.C., U.S.A. (NMNH); Biozentrum Grindel und Zoologisches Museum, Hamburg, Germany (BGZM); Department of Entomology, Tarbiat Modares University, Tehran, Iran (TMUI) and University of Michigan Museum of Zoology, Ann Arbor, Michigan, U.S.A. (UMMZ).

### Taxonomy

#### Podapolipidae Ewing 1922

#### *Eutarsopolipus hemistylus* Husband and Husband sp. nov. (Figs. 1-3)

**Differential diagnosis.** Cheliceral stylets of adult female *E. hemistylus* 47-50.

Setae  $h_1$  are 6-15 for adult female *E. hemistylus* and 22-29 for *E. americanus* (stylets 90-100) with the same host species (Table 1). Stylets of larval females of *E. hemistylus* (31-38) are longer than stylets of larval female *E. mirifici* Husband (23) and shorter than stylets of *E. americanus* (57-60). Gnathosomal setae  $ch_1$  of larval female *E. hemistylus* (12-20) are nearly  $\frac{1}{2}$  the lengths of stylets (31-40) in contrast to short setae  $ch_1$  in *E. jacobi* Husband (7-10) with stylets 34-35. Femur I setae  $l'$  for adult female *E. hemistylus* are 3-4 in contrast to 17 in female *E. jacobi*. Male stylets of *E. hemistylus* are 19-23 in contrast to 29-30 in *E. americanus*. Male prodorsal setae  $sc_1$  and plate C/D setae  $d$  are  $m$  in *E. hemistylus* and  $5$  in *E. americanus*. Males of *E. hemistylus* have widths of genital capsules (18-22) about equal to stylet lengths (19-23) in contrast to widths of genital capsules of *E. jacobi* (30) distinctly wider than stylet lengths (20-21).

### Description

Female (Fig. 1,  $n = 6$ ). Gnathosoma length 50-55, width 46-55. Cheliceral stylets length 47-50, pharynx width 14-15, setae  $ch_1$  14-15,  $su$  3-4, distance  $su-su$  17. Idiosoma. Stigmata at posterolateral margins of gnathosoma. Idiosoma length 255-462, width 195-245. Prodorsal seta  $v_1$  5-7,  $v_2$   $v$ ,  $sc_1$  5-6,  $sc_2$  35-42, distance  $v_1-v_1$  32. Plate C setae  $c_1$  5-6,  $c_2$  6-9, plate D setae  $d$  7, plate EF setae  $e$  5-7, plate H setae  $h_1$  6-15 (Table 1). Right cupule  $ia$  evident in holotype. Left cupule obscured. Distance  $h_1-h_1$  20-22. Venter with apodemes 1, 2 faint, coxal setae  $1a$  and  $2a$  2,  $3a$  2-5, seta  $3b$  6-9.

Legs. Setation (including solenidia) for femur, genu, tibia, tarsus I, II, III 2-0-7-8, 0-0-4-7, 0-0-4-6, respectively. Ambulacra I, II, III with prominent claws. Femur I setae  $l'$  3-4. Tibia I setae  $d$  25, solenidion  $\phi$  5, tarsus I solenidion  $\omega$  5. Tibia II setae  $d$  10, tarsus II solenidion  $\omega$  5. Tibia III setae  $d$  8, tarsus III  $pl''$  15.

Male (Fig. 2,  $n = 10$ ). Gnathosoma length 25-30, width 23-32. Cheliceral stylets 19-23, setae  $ch_1$  5-7,  $su$   $m$ , distance  $su-su$  10.

Idiosoma. Length 125-158, width 81-103 (Table 1). Prodorsal plate setae  $v_1$   $m$ ,  $v_2$   $v$ ,  $sc_1$   $m$ ,  $sc_2$  40-47, distance  $v_1-v_1$  18-23. Fused plates CD setae  $c_1$   $m$ ,  $c_2$   $m-2$ ,  $d$   $m$ , plate EF seta  $e$   $m-2$ . Aedeagus length 18-28, width 18-22. Venter with apodemes moderately developed. Coxal setae  $1a$  and  $2a$   $m$ ,  $3a$   $m-2$ ,  $3b$  4-5.

Legs. Setation (including solenidia) for femur, genu, tibia, tarsus legs I, II, III 2-0-7-8, 0-0-4-7, 0-0-4-5, respectively. Femur I seta  $l'$   $m$ ,  $d$   $m$ , tibia I seta  $d$  15-20, solenidion  $\phi$  4-5, tarsus I solenidion  $\omega$  5. Tibia II seta  $d$  5-7. Tibia III seta  $d$  5-7, tarsus III seta  $pl''$  10-13. Ambulacrum I with one claw, ambulacra II, III without claws.

Larval female (Fig. 3,  $n = 8$ ). Gnathosoma length 32-40, width 35-43. Cheliceral stylet length 31-40. Pharynx width 8-10, seta  $ch_1$  12-20, seta  $su$   $m$ , distance  $su-su$  9-10.

Idiosoma. Length 150-182, width 105-182 (Table 1). Prodorsal plate seta  $v_1$  2-5,  $v_2$   $v$ , seta  $sc_1$  5-7,  $sc_2$  47-70, distance  $v_1-v_1$  20-23. Plate C seta  $c_1$  3-5,  $c_2$  5-7,

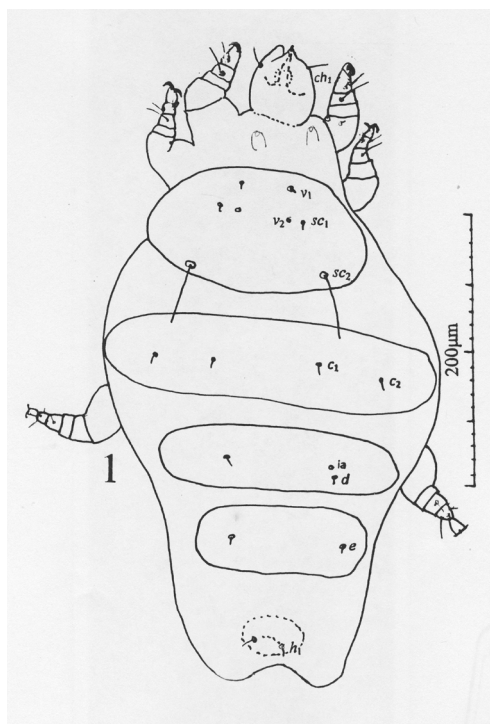


Figure 1. *Eutarsopolipus hemistylus* Husband and Husband sp. nov., adult female, dorsal view.

plate D seta d 3-5, plate EF seta e 3-5 (one 10), plate H seta h<sub>1</sub> 74-80, h<sub>2</sub> 20-25, distance h<sub>1</sub>-h<sub>1</sub> 3-6. Venter with apodemes 1, 2 weakly developed, apodemes 2 not extending to sternal apodeme. Coxal setae 1a and 2a m, 3a and 3b 6-7.

Legs. Setation (including solenidia) for femur, genu, tibia, tarsus legs I, II, III 2-0-7-8, 0-0-4-7, 0-0-4-5. Ambulacrum I with two claws (2-5), ambulacra II, III without claws. Femur I seta l' m-2, d m, tibia I seta d 18-25, solenidion  $\phi$  5, setae k 3-5, tarsus I solenidion  $\omega$  5. Tibia II, III d 5-10 and 5-8, respectively. Tarsus II solenidion 5, tarsus III seta pl<sup>r</sup> 10-15.

Egg (n=1). Length 240, width 135.

Etymology. The name *Eutarsopolipus hemistylus* is derived from the lengths of adult female stylets (47-50) that are approximately 1/2 the lengths of stylets in a second species with the host *C. prasinus*, *E. americanus*, with stylets of adult female 90-100.

Host. Mites were found on the basal portion of hind wings, meso- and meta- thoracic tergites under the elytra of beetles, *C. prasinus*.

Type material. Holotype, adult female (RWH200309-11), from *C. prasinus* Cincinnati, Hamilton County, Ohio, U.S.A., June 1934, collector unknown, deposited in the University of Michigan Museum of Zoology UMMZ). Paratypes, two adult females, 1 male, with same data as holotype; one adult female, two males, one larval female, Inglebrook, Illinois, 12 September 1909, collector unknown; one male, one larval female, Henderson, Kentucky, 10 April 1928, collector unknown and one larval female with same locality collected 9 September 1928, collector unknown; one female, two males, one egg on slide with male, Southern Pines, North Carolina, 16 May 1917, A. H. Manee leg; one female,

Table 1. Comparison of selected maximum measurements for species in the hemistylus subgroup of the myzus group of the genus *Eutarsopolipus*: *E. hemistylus* (*Eh*), *E. jacobi* (*Ej*), *E. caudatus* (*Ec*), *E. regenfussi* (*Er*), *E. tomentosi* (*Eto*), *E. mirifici* (*Em*), *E. terricolae* (*Ete*), and a non-hemistylus species, *E. americanus* (*Ea*). Measurements for *E. americanus* of the longistylus subgroup of the myzus group with female stylets 90-100 are included as this mite shares the host species, *Clenius prasinus*, with *E. hemistylus*. All measurements are in micrometers.

| Character                         | <i>Eh</i> | <i>Ej</i> | <i>Ec</i> | <i>Er</i> | <i>Eto</i> | <i>Em</i> | <i>Ete</i> | <i>Ea</i> |
|-----------------------------------|-----------|-----------|-----------|-----------|------------|-----------|------------|-----------|
| ADULT FEMALES                     |           |           |           |           |            |           |            |           |
| Idiosoma length                   | 462       | 600       | 500       | 590       | 233        | 600       | 645        | 727       |
| Idiosoma width                    | 245       | 480       | 360       | 298       | 170        | 280       | 371        | 620       |
| Gnathosoma width                  | 55        | 57        | 48        | 48        | 53         | 75        | 55         | 108       |
| Cheliceral stylets                | 50        | 52        | 60        | 48        | 46         | 49        | 50         | 100       |
| Gnathosomal setae ch <sub>1</sub> | 15        | 15        | 25        | 23        | 7          | 20        | 24         | 30        |
| Idiosomal setae v <sub>1</sub>    | 7         | 7         | 8         | 6         | 4          | 8         | m          | 10        |
| sc <sub>1</sub>                   | 6         | 6         | 11        | 7         | 4          | 9         | m          | 20        |
| h <sub>1</sub>                    | 15        | 15        | 56        | 16        | 8          | 12        | 7          | 29        |
| Femur I setae l'                  | 4         | 17        | 18        | 12        | 3          | 16        | 12         | 22        |
| Tibia I setae d                   | 25        | 34        | 39        | 41        | 24         | 27        | c. 27      | 50        |
| Tibia III setae d                 | 8         | 8         | 8         | 10        | 8          | 9         | c. 10      | 10        |
| Tarsus III setae pl'              | 15        | 17        | 17        | 22        | 11         | 12        | c. 20      | 38        |
| Coxae 3a setae                    | 9         | 5         | 12        | 4         | 2          | 12        | 5          | 13        |
| MALES                             |           |           |           |           |            |           |            |           |
| Idiosoma length                   | 158       | 205       | 178       | 136       | 162        | 208       | 184        | 237       |
| Idiosoma width                    | 103       | 122       | 180       | 99        | 115        | 140       | 144        | 172       |
| Gnathosoma width                  | 32        | 33        | 30        | 27        | 32         | 40        | 34         | 48        |
| Cheliceral stylets                | 23        | 21        | 20        | 18        | 23         | 17        | 12         | 30        |
| Gnathosomal setae ch <sub>1</sub> | 7         | 6         | 7         | 6         | 9          | 4         | 12         | 8         |
| Genital capsule length            | 28        | 30        | 20        | 22        | 23         | 30        | 30         | 31        |
| Genital capsule width             | 22        | 30        | 20        | 22        | 25         | 35        | 35         | 31        |
| Femur I setae l'                  | m         | 2         | m         | m         | m          | m         | 4          | 5         |
| Tibia I setae d                   | 20        | 25        | 31        | 28        | 25         | 12        | 18         | 30        |
| Tibia III setae d                 | 7         | 7         | 3         | 8         | 4          | 2         | c. 8       | 5         |
| Tarsus III setae pl'              | 13        | 15        | 10        | 22        | 16         | -         | c. 7       | 12        |
| LARVAL FEMALES                    |           |           |           |           |            |           |            |           |
| Idiosomal length                  | 182       | 235       | 152       | 230       | 290        | 150       | 209        | 390       |
| Idiosomal width                   | 182       | 190       | 130       | 130       | 190        | 120       | 127        | 230       |
| Gnathosoma width                  | 36        | 40        | 38        | 33        | 37         | 31        | 47         | 65        |
| Cheliceral stylets                | 38        | 35        | 38        | 30        | 37         | 23        | 27         | 60        |
| Gnath. setae ch <sub>1</sub>      | 20        | 10        | 18        | 12        | 7          | 12        | 17         | 20        |
| Idiosomal setae v <sub>1</sub>    | 7         | 8         | 4         | 3         | 4          | 6         | m          | 3         |
| sc <sub>1</sub>                   | 7         | 6         | -         | 3         | 3          | 5         | m          | 13        |
| h <sub>2</sub>                    | 23        | 31        | 32        | 27        | 28         | 18        | 39         | 50        |
| Femur I setae l'                  | 2         | 6         | 2         | 5         | m          | -         | c. 5       | 10        |
| Tibia I setae d                   | 25        | 28        | 33        | 26        | 23         | -         | -          | 50        |
| Tibia III setae d                 | 8         | 5         | 6         | 7         | 8          | -         | -          | 10        |
| Tarsus III setae pl'              | 15        | 14        | 12        | 14        | 14         | -         | -          | 26        |

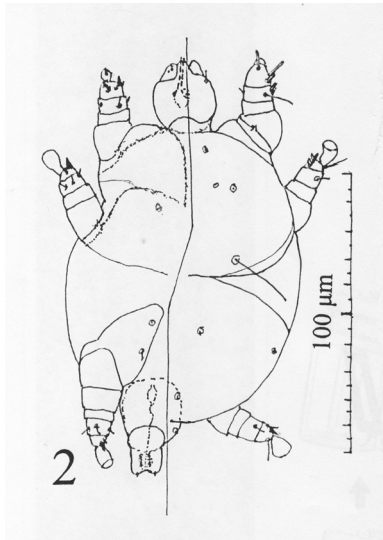


Figure 2. *Eutarsopolipus hemistylus* Husband and Husband, sp. nov., male.

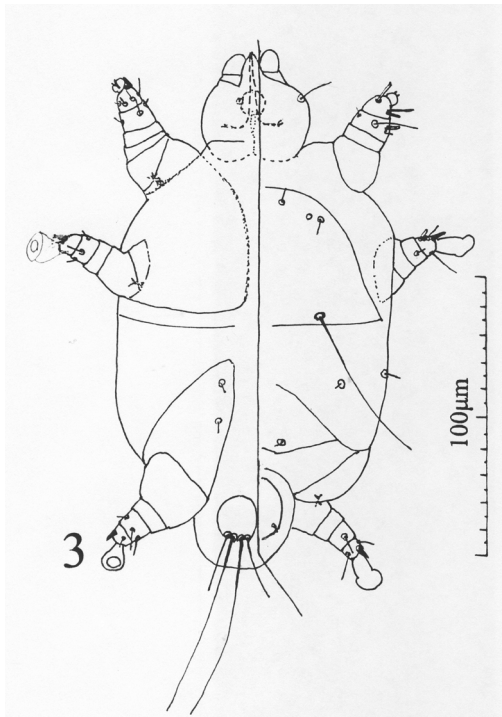


Figure 3. *Eutarsopolipus hemistylus* Husband and Husband, sp. nov., larval female.

two larval females, Southern Pines, North Carolina, 5 June 1914, collector unknown: two males, one larval female on the same slide as one of the males, Rome, Georgia, 13 July 1930, C. F. Byers leg; two males, three larval females, Van Buren, Carter County, Missouri, 21 June 1930, collector G. A. Pence. One adult female, one male and one larval female are deposited in each of the following museums: NSMT, TMUI, NMNH, BGZM and UMMZ. The remaining paratypes are deposited at UMMZ.

### Discussion

Fifty-six species of *Eutarsopolipus* in 14 groups were discussed and a key to groups was presented by Husband and Husband (2009). Husband and Husband (2013) added *E. americanus*. Husband and Kurosa (2013) added *E. asiaticus* and presented a key to 18 species in the myzus group. The species described herein, *E. hemistylus*, is assigned to myzus subgroup hemistylus, intermediate between the longistylus (90-110) subgroup (two species) and the brevistylus (23-40) subgroup (10 species) of the myzus group. Initially, five species of *Eutarsopolipus* were placed in the myzus group based on the apomorphic characters: genu III without setae and larval females with trochanter I bearing a lobe (Regenfuss 1968). Relationships with species in the myzus group discovered since 1968 were discussed by Husband and Husband (2012). The five species listed by Regenfuss (1968) as comprising the myzus group have idiosomal lateral bulges. Regenfuss (1974) described *E. caudatus*, myzus group, and noted it is cylindrical and lacks lateral bulges. Khaustov (2010) described *E. steveni* and noted the cylindrical shape as in female *E. caudatus*. Adult female *E. steveni* females have shorter stylet lengths (28-31) and shorter setae  $h_1$  (24-26) than *E. caudatus* (56). Hajiqaanbar and Mortazavi (2012) described two species of *Eutarsopolipus* in the myzus group in Iran: adult female *E. anichtchenkoi* with cheliceral stylets 32-35 and setae  $h_1$  3-4 in contrast to adult female *E. terricolae* with stylets 49-50 and setae  $h_1$  7. With a majority of the 34,275 species of Carabidae (Lorenz, 2005) not examined for podapolipid mites, we anticipate additional discoveries of podapolipid mites from Carabidae as more potential host species are examined and relationships of their parasitic podapolipid mites are studied.

### Acknowledgments

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