A new species of *Eutarsopolipus* (Acari: Podapolipidae) from *Chlaenius tomentosus* (Coleoptera: Carabidae) from Rome, Georgia, U.S.A.

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(With 3 figures)

**Abstract**

*Eutarsopolipus tomentosi* sp. n. (Acari: Podapolipidae) is described from *Chlaenius tomentosus* (Coleoptera: Carabidae) from Rome, Georgia (U.S.A.) and compared with related *Eutarsopolipus* in the *myzus*-group of *Eutarsopolipus*. Keys to species in the *myzus*-group are included.

**Introduction**

Mites in the family Podapolipidae (Acari: Tarsonemini) are all highly specialized ecto- and endoparasites of insects of the orders Blattaria, Orthoptera, Heteroptera, Hymenoptera and especially Coleoptera. All mites in the genus *Eutarsopolipus* are ectoparasites of carabid beetles.

A survey of insects in the collection of the University of Georgia by the senior author in 1971-1972 yielded many podapolipid mites from carabid beetles and other insects. Mites from carabid beetles were sent to Hans Regenfuss, then of the University of Freiburg, Germany. He described two species of *Eutarsopolipus* from Georgia (Regenfuss, 1974). Hans Regenfuss died in 1979 and left a number of unfinished projects. Gisela Rack, Zoological Museum, University of Hamburg, acquired the Regenfuss Collection in 1985. *E. pungens* from Georgia was described from *Chlaenius sericeus* Frost by Husband and Dastych (1998). The purpose of this paper is to describe a new species of mite from the Regenfuss Collection from the carabid beetle, *Chlaenius tomentosus* (Say), collected in Rome, Georgia, provide a key to groups of *Eutarsopolipus*, and provide a key to the ten species in the *myzus*-group as modified from Regenfuss (1968).

**Materials and Methods**

The technique for removing mites from beetles is described in Husband and Dastych (1998). Measurements were taken with the aid of a Zeiss phase contrast microscope with a drawing tube and stage micrometer. All measurements are in micrometers (μm). Setae no
Fig. 1. *Eutarsopolipus tomentosi* sp. n., adult female: ventral and dorsal aspects.
longer than the diameter of their setal sockets are listed as microsetae (m). Often long setae are obscured, bent, broken or at an angle which makes measurement difficult. Setae are at least as long as indicated. Terminology is based on Lindquist (1986). Type material is deposited in the Zoological Museum Hamburg (ZMH) and in the collection of the senior author, Adrian (RWH).

**Systematics**

Family Podapolipidae Ewing, 1922  
Genus *Eutarsopolipus* Berlese, 1913

*Eutarsopolipus tomentosi* sp. n.  
(Figs 1-3)

**TYPE DATA:** Holotype; Male, 15 April 1937. ZMH, Reg. No. A30/1985-637; collected by P. W. Fattig at Rome, Georgia, U.S.A., collected from *Chlaenius tomentosus* (Say) (Coleoptera: Carabidae).

Paratypes (same data as holotype): allotype female, ZMH, Reg. No. A30/1985-641; 1 female, 2 males, 1 larval female (exoskeleton), 1 egg; 1 female (with associated larval female exoskeleton), 1 male, 1 egg with the holotype: ZMH; 1 male, RWH.

**ETYMOLOGY.** *Eutarsopolipus tomentosi* sp. n. is named for the host species *Chlaenius tomentosus*.

**DIAGNOSIS:** Adult females of *Eutarsopolius tomentosi* sp. n. are distinguished from other members of the *myzus*-group of *Eutarsopolipus* by a wider pharynx, from *E. regenfussi* Husband & Swihart, 1986 and *E. quebecensis* Husband, 1968 by shorter dorsal gnathosomal setae and from *E. quebecensis* and *E. latus* Regenfuss, 1974 by longer setae *h*₁(7) (Table 1). Setae *v₁, v₂* are at least 4 μm long in female *E. tomentosi* while these setae are microsetae in *E. latus*. Adult females of *E. regenfussi* and *E. tomentosi* have cheliceral stylets 45-46 compared to cheliceral stylets 35-36 for *E. latus* and *E. quebecensis*. Femur I length varies from 3 in *E. tomentosi* to 5 μm in *E. latus* to 12-14 in *E. quebecensis* and *E. regenfussi*. Cheliceral stylets of larval female *E. tomentosi* are 37 compared to 25-27 in *E. regenfussi* and *E. latus*. The width of the genital capsule of male *E. tomentosi* sp. n. is 22-25, in contrast to capsules with widths of 31-35 in *E. regenfussi* and *E. latus*.

**DESCRIPTION:** ADULT FEMALE (Fig. 1). Gnathosoma length 52, width 53. Cheliceral stylet length 46. Pharynx width 21, dorsal gnathosomal seta 7, ventral seta 3. Stig mata prominent, at posterolateral margin of gnathosoma. Idiosoma: prodorsal plate wider than long, setae *v₁, v₂* 4, *sc₂* 50. Setae *v₂* lateral to a line connecting *v₁* and *sc₂*. Plate *C* length 55, setae *c₁, c₂* 7; plate *D* length 62, seta *d* 4. Plate *EF* length 65, seta *f* 5. Venter with apodemes 1 moderately developed, meeting sternal apodeme medially. Coxal setae *1a m, 2a m, 3a 2, 3b 6*. Distance between setae *3a* and *3b* 32. Setae *h₁, 7*, no setae *h₂*. Legs: leg setation as in Table 2. Ambulacrum I, II, III with prominent claws. Femur I seta *l* 3. Single tarsus I spine, two terminal spines on each
Figs 2-3. *Eutarsopolipus tomentosi* sp. n., ventral and dorsal aspects. 2 - male, 3 - larval female.

MALE (Fig. 2). Gnathosoma length 30-32, width 31-32. Cheliceral stylet length 22-23, palp length 8-10; pharynx width 7-8, dorsal gnathosomal seta 8-9, ventral seta m, distance between ventral setae 12. Idiosoma: length 154-162, width 103-115. Prodorsal plate setae v, v2, m, sc 42. Setae c1, c2, d, m. Venter with apodemes 1 and 2 moderately developed, meeting sternal apodeme medially. Coxal setae 1a, 2a, 3a m. Coxl setae 3b 2. Legs: leg setation as in Table 2. Ambulacrum I with one claw, ambulacra II, III with minute thin claws. Single tarsus I spine, two terminal spines on each of tarsi II, III. Tarsus I solenidion ω 3-4. Tibia I solenidion φ 4. Seta k 2-3. Tibia I seta d 25, tibia II seta d 12, tibia III setae d 6. Femur I seta l’ m. Genital capsule length 19-22, width 22-25, with concave lateral margins.

LARVAL FEMALE (Fig. 3). Gnathosoma length 35, width 37. Cheliceral stylet length 37. Palp length 10; dorsal gnathosomal seta 17, ventral seta m. Idiosoma: setae v, 4, v2 3, sc long (broken). Distance between setae v, 22; distance between setae sc 47. Setae c1, c2 5, d 6, f 5. Venter with apodemes 1 and 2 weakly developed, meeting sternal apodeme medially. Coxal setae 1a m, 2a m; 3a 7, 3b 7. Distance between setae 3a and 3b 20. Setae h, 130, h2 28. Distance between setae h1 2. Legs: setation pattern as in the male. Ambulacrum I with small claws; ambulacra II, III without claws. Single tarsus I spine, two terminal spines on each of tarsi II, III. Femur I seta l’ m. Tarsus I solenidion ω 3. Tibia I solenidion φ, seta k 3. Tibia I seta d’ 23, tibia II, III setae d 8.

EGGS. Oval, length 205-265, width 125-129.

Discussion

Regenfuss (1968) was correct in creating the desani-group of Eutarsopolipus for the single species E. desani Cooreman, 1952 found in Central Africa. Recent discoveries of male and larval female E. desani reveal additional characters for the group (Husband, in review). Male E. desani have genital capsules which are rectangular, with straight lateral margins. The species with this and other characters of the desani group are E. desani and E. pungens. Regenfuss (1974) placed E. latus from Georgia with the desani group. However, the genital capsule of the male stage has concave lateral margins which are characteristic of E. myzus Regenfuss, 1968. It is inevitable with the discovery of many more species of Eutarsopolipus that changes in perspective will occur. Based on current knowledge, E. latus, E. caudatus Regenfuss, 1974, E. regenfussi and E. tomentosi sp. n., all males with genital capsules with concave lateral margins, are in the myzus-group.

Regenfuss (1968) defined the myzus-group of Eutarsopolipus in part as follows: females with claws on legs I, II, III well developed, stigmata and trachea evident, plates C, D evident, without genu III setae and femur I l’ long. He noted that larval females have trochanteral extensions beneath the gnathosoma. We have not found this character in species in the myzus-group yet. We note that ambulacral claws I of
males and larval females in the myzus-group are relatively small. Ambulacral claws II, III, if present, are small in males and larval females.

Regenfuss (1972) discusses the concept of microhabitats as related to adult female podapolipid mites on carabids. Shapes and cheliceral stylet lengths of adult female mites are related to spaces occupied. Different species of parasitic mites occupy different spaces on carabid hosts. Regenfuss (1968) noted that adult females in the myzus-group may be distinguished by shape but larvae and males of E. myzus, E. abdominis Regenfuss, 1968, E. squamarum Regenfuss, 1968, E. thoracis Regenfuss, 1968 and E. poecili Regenfuss, 1968 are very similar and can not be distinguished. We found the same difficulty with American and European species in the myzus-group. Cheliceral styles of larval E. caudatus and E. tomentosi sp. n. are longer (37-38) than stylets of other species (24-30) but other variations are less obvious. Likewise, the width of male genital capsules of E. tomentosi sp. n. (22-25) are narrower than that of capsules of E. regenfussi (32-35) but other variations are less obvious.

The following key to groups of Eutarsopolipus is based on adult female characters established by Regenfuss (1968).

**Key to the species groups of Eutarsopolipus**

1. With setae on each of genua I, II, III ................................................. 2  
   Without setae on each of genua I, II, III ........................................ 4
2. Plates C, D present, with femur I seta v"........................................ 3  
   Plates C, D not present, without femur I seta v" ............................. stammeri
3. Prodorsal setae v1, v2 at most 5 μm, seta c2 at most vestigial  ........ acanthomus  
   Prodorsal setae v1, v2 14-23 μm, seta c2 6-8 μm ........................... ochoi
4. Genu I with 2 setae ................................................................. 5  
   Genu I without setae ............................................................... 6
5. Femur I seta v" present ........................................................... catadromi  
   Femur I seta v" not present ....................................................... encoreus
6. Stigmata and trachea conspicuous ............................................. 7  
   Stigmata and trachea not conspicuous or not present ....................... pterostichi
7. Tarsus II solenidion present, cheliceral stylets less than 140 μm ........ 8  
   Tarsus II solenidion not present, chel. stylets 140-145 μm ................ lagenaeformis
8. Coxal setae 1a, 2a at most 3 μm .............................................. 9  
   Coxal setae 1a, 2a 7-10 μm ...................................................... desani
9. Either ambulacrum I or II with a strong claw .............................. myzus  
   All ambulacra without claws .................................................. biunguis

Included in the myzus-group are: E. myzus, E. abdominis, E. squamarum, E. thoracis, E. poecili, E. latus, E. caudatus, E. regenfussi, E. quebecensis, E. sp. n. (Husband, in review) and E. tomentosi n. sp. Regenfuss illustrated male and larval E. myzus but we were unable to find males or larvae in the collection. In the keys to species of the myzus-group, we follow Regenfuss, in part, in using characteristic shapes of adult females to distinguish species.
Table 1. Maximum measurements of some American *Eutarsopolipus* in the *myzus*-group.

<table>
<thead>
<tr>
<th>Character</th>
<th><em>E. tomentosi</em></th>
<th><em>E. latus</em></th>
<th><em>E. regenfussi</em></th>
<th><em>E. quebecensis</em></th>
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<tbody>
<tr>
<td><strong>FEMALE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Idiosomal length</td>
<td>233</td>
<td>400</td>
<td>590</td>
<td>630</td>
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<tr>
<td>Idiosomal width</td>
<td>170</td>
<td>350</td>
<td>398</td>
<td>570</td>
</tr>
<tr>
<td>Cheliceral stylets</td>
<td>46</td>
<td>35</td>
<td>48</td>
<td>36</td>
</tr>
<tr>
<td>Pharynx width</td>
<td>21</td>
<td>13</td>
<td>14</td>
<td>17</td>
</tr>
<tr>
<td><strong>Setae:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dorsal gnathosoma</td>
<td>7</td>
<td>5</td>
<td>16</td>
<td>24</td>
</tr>
<tr>
<td>Ventral gnathosoma</td>
<td>3</td>
<td>m</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>(v_1,v_2)</td>
<td>4,4</td>
<td>m,m</td>
<td>3,4</td>
<td>8,9</td>
</tr>
<tr>
<td>(c_2)</td>
<td>7</td>
<td>3</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>(h_1)</td>
<td>8</td>
<td>m</td>
<td>11</td>
<td>0</td>
</tr>
<tr>
<td>Femur I (l^{'})</td>
<td>3</td>
<td>5</td>
<td>12</td>
<td>14</td>
</tr>
<tr>
<td>Coxa 3a, 3b</td>
<td>3,6</td>
<td>2,4</td>
<td>(m,5)</td>
<td>7,7</td>
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<tr>
<td><strong>MALE</strong></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Idiosomal length</td>
<td>162</td>
<td>190</td>
<td>136</td>
<td>no male</td>
</tr>
<tr>
<td>Idiosomal width</td>
<td>115</td>
<td>100</td>
<td>99</td>
<td>-</td>
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<tr>
<td>Cheliceral stylets</td>
<td>23</td>
<td>21</td>
<td>14</td>
<td>-</td>
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<td>Gen. capsule length</td>
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<td>-</td>
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<tr>
<td>Gen. capsule width</td>
<td>25</td>
<td>31</td>
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</tr>
<tr>
<td>Dorsal gnath. setae</td>
<td>9</td>
<td>10</td>
<td>7</td>
<td>-</td>
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<td><strong>LARVAL FEMALE</strong></td>
<td></td>
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<td></td>
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<tr>
<td>Idiosomal length</td>
<td>290</td>
<td>165</td>
<td>144</td>
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<tr>
<td>Idiosomal width</td>
<td>190</td>
<td>93</td>
<td>108</td>
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<tr>
<td>Cheliceral stylets</td>
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<td>27</td>
<td>-</td>
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<tr>
<td>Pharynx width</td>
<td>10</td>
<td>8</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>Dorsal gnath. setae</td>
<td>17</td>
<td>17</td>
<td>19</td>
<td>-</td>
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<tr>
<td>Setae (sc_2)</td>
<td>82</td>
<td>34</td>
<td>4</td>
<td>-</td>
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<tr>
<td>Setae (h_2)</td>
<td>28</td>
<td>29</td>
<td>25</td>
<td>-</td>
</tr>
<tr>
<td>Setae femur I (l^{'})</td>
<td>(m)</td>
<td>5</td>
<td>(m)</td>
<td>-</td>
</tr>
</tbody>
</table>

Recently, specimens of *Eutarsopolipus* in the *myzus*-group from Vermont, Minnesota, and Wyoming, U.S.A. have been found on *Chlaenius* species. Investigations of these podapolipid mites are in progress.
Table 2. Leg setation for femora (F), genua (G), tibiae (Ti), tarsi (Ta) for Eutarsopolipus myzus, E. latus and E. tomentosi sp. n. A vestige of setae ft" is present on tarsus I. Seta pl" is present on tarsus III of E. myzus. Dorsipes evarhurusi Husband & Rack, 1991, from a carabid host, is included to contrast with reduction of femoral and genual setation in species in the myzus-group.

<table>
<thead>
<tr>
<th>Species</th>
<th>Leg I</th>
<th>Leg II</th>
<th>Leg III</th>
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<tr>
<td></td>
<td>F G Ti Ta</td>
<td>F G Ti Ta</td>
<td>F G Ti Ta</td>
</tr>
<tr>
<td>myzus-group</td>
<td></td>
<td></td>
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<tr>
<td>E. myzus</td>
<td>2 0 7 9</td>
<td>0 0 4 7</td>
<td>0 0 4 7</td>
</tr>
<tr>
<td>E. latus</td>
<td>2 0 7 9</td>
<td>0 0 4 7</td>
<td>0 0 4 6</td>
</tr>
<tr>
<td>E. tomentosi sp. n.</td>
<td>2 0 7 9</td>
<td>0 0 4 7</td>
<td>0 0 4 6</td>
</tr>
<tr>
<td>platymae-group of Dorsipes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D. evarhurusi</td>
<td>3 3 7 9</td>
<td>1 2 4 6</td>
<td>1 1 4 5</td>
</tr>
</tbody>
</table>

Key to adult females in the myzus-group of Eutarsopolipus

1. Propodosoma does not cover the gnathosoma ........................................... 2
   Propodosoma covers the gnathosoma ...................................................... E. poecili
2. Without wrinkled opisthosomal lobes; if lobes, then lobes not equal to size of gnathosoma ...................................................... 3
   With wrinkled opisthosomal lobes, lobes equal to size of gnathosoma ........... E. quebecensis
3. Plate C entire ......................................................................................... 4
   Plate C divided ....................................................................................... E. latus
4. Idiosoma not teardrop-shaped ................................................................... 5
   Idiosoma teardrop-shaped ......................................................................... E. thoracis
5. Idiosoma elongate, oval, without lateral bulges beyond plate C .................. 6
   Idiosoma elongate, with lateral bulges near plate C .................................... 9
6. Lengths of femur I’ , h, exceed 10μm ....................................................... 7
   Lengths of femur I’ , h, less than 10μm .................................................... E. tomentosi n. sp.
7. Setae h1, shorter than 20μm ..................................................................... 8
   Setae h1, longer than 30μm ................................................................. E. caudatus
8. Ventral gnathosomal setae, setae v2 microsetae ........................................ E. regenfussi
   Ventral gnathosomal setae, setae v2 at least 5μm ..................................... E. sp. n. (Husband, in review)
9. Idiosoma broadest anterior to the plane of plate D .................................... 10
   Idiosoma broadest near the plane of plate D ............................................ E. squamarum
10. Caudal to the posterior margin of plate EF, the idiosoma expands laterally.

Caudal to the posterior margin of plate D, lateral margins of the idiosoma are parallel.

Acknowledgments

The authors are grateful to the late Preston Hunter and W. T. Atyeo, Entomology Department, University of Georgia, Athens, Georgia, U.S.A. for making insects available for examination and for permission to describe and retain parasitic mites from carabid beetles. The help of the following scientists is appreciated: Robert L. Davidson, Carnegie Museum of Natural History, Pittsburgh, Pennsylvania, Fred Stehr, Entomology Museum, Michigan State University, E. Lansing, Michigan and Jeffrey Lockwood, Dept. of Plant, Soil and Insect Sciences, Univ. of Wyoming, Laramie, Wyoming, U.S.A. for the loan of beetles for examination; Barry M. O'Connor, Museum of Zoology, Univ. of Michigan, Ann Arbor, Michigan and Debbie Creel, U. S. National Museum of Natural History for loan of type specimens.

Literature


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