Entomol. Mitt. zool. Mus. Hamburg	12 (158): 317-326	Hamburg, 15. Oktober 1998 ISSN 0044-5223

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

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(With 5 figures)

Abstract

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

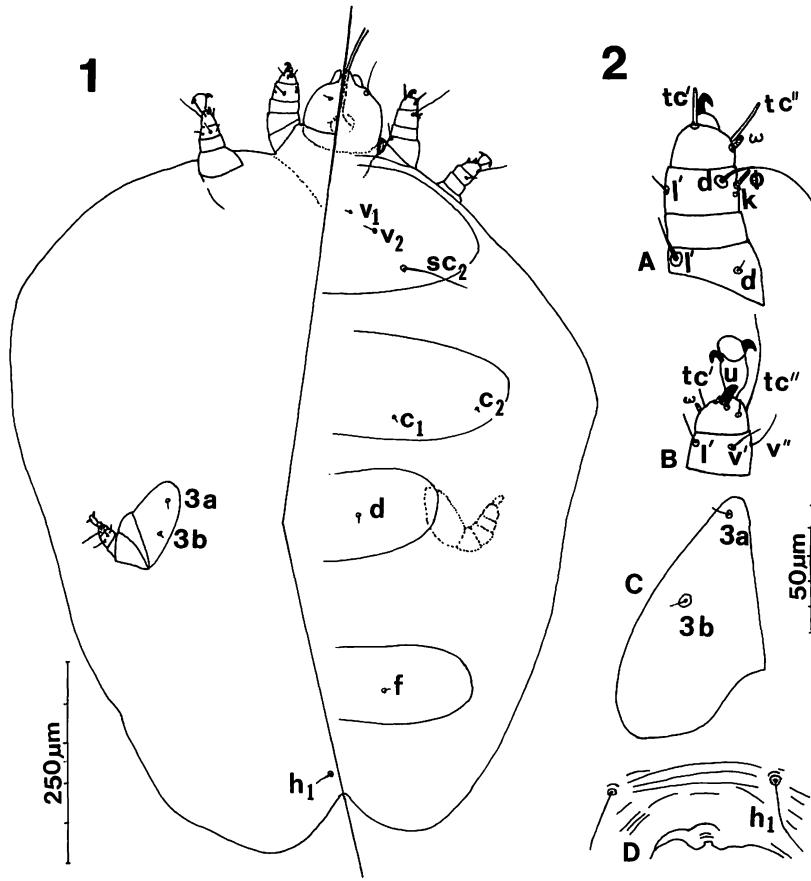
Introduction

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. The authors are slowly working through the Regenfuss collection of podapolipid mites in an attempt to complete the unfinished work of Regenfuss. The purpose of this paper is to describe a new species of mite from the Regenfuss Collection from the carabid beetle, *Chlaenius sericeus* Frost, collected in Athens, Georgia, to provide a key to groups of *Eutarsopolipus*, and to provide a key to the seven species of the *myzus*-group as defined by Regenfuss (1968).

Materials and Methods

Beetles were heated in hot water for about 1/2 hour in order to lift elytra without damaging pinned specimens. Mites were visually removed or washed from the beetles with 70% ethanol, mounted in Hoyer's mounting medium, placed on a heating tray and later ringed with nail polish.



Figs 1-2. *E. pungens* sp. n.: 1 - adult female; ventral and dorsal aspects; 2 (A-D): A - dorsal aspect of leg I; B - ventral aspect of leg II; C - coxa III with setae *3a, 3b*; D - opisthosoma with seta h_1.

Recently, mites were remounted in Hoyer's medium, heated again and ringed with Glyptal electrical insulating paint. Measurements were taken with the aid of a Zeiss phase contrast microscope with a drawing tube and stage micrometer. All measurements are in micrometers. Setae no 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), in the collection of the senior author, Adrian (RWH) and in the U. S. National Museum Washington, D.C. (USNM).

Systematics

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

Eutarsopolipus pungens sp. n.
(Figs 1-5)

TYPE DATA: H o l o t y p e: female, 18 May 1939, collected by J.R. Goviner at Athens, Clark Co., Georgia, U.S.A., from *Chlaenius sericeus* Frost (Coleoptera: Carabidae). *Deposited* in ZMH, Reg. No. A30/1985-440.

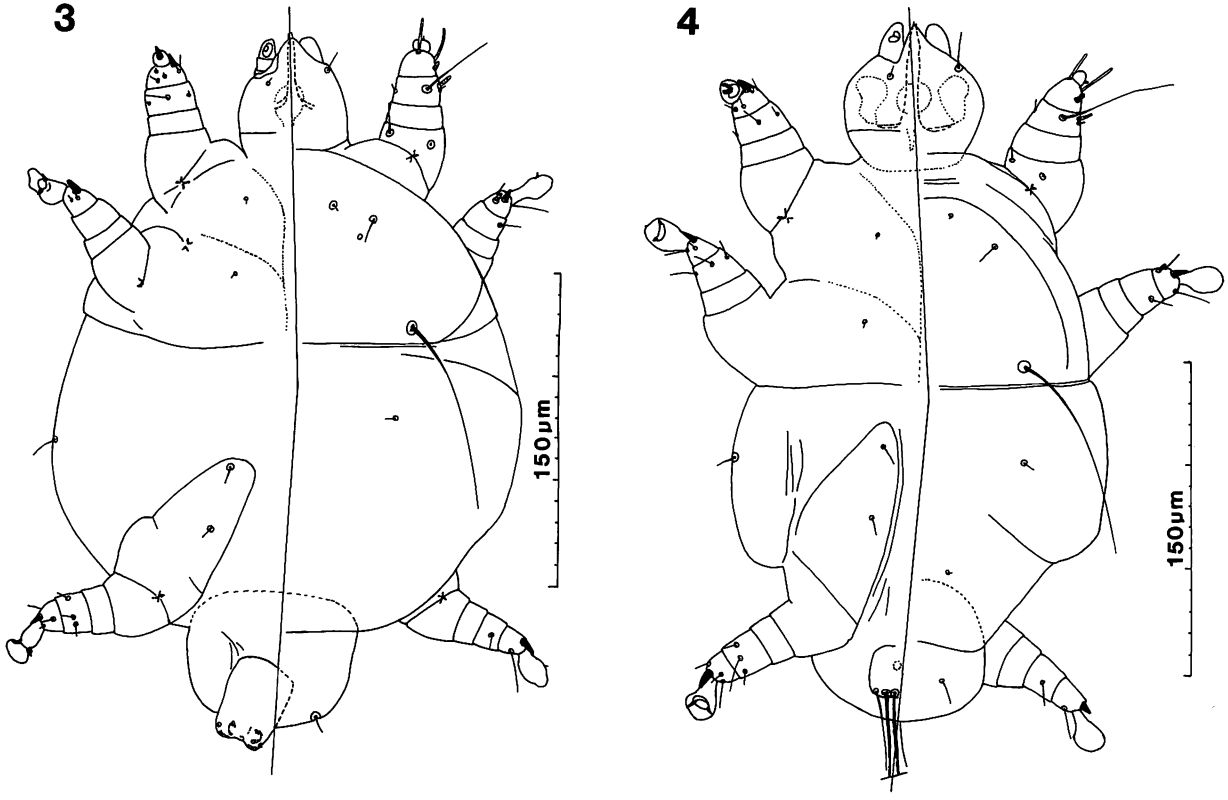
P a r a t y p e s: allotype male, same data as holotype: ZMH Reg. No. A30/1985-445, deoposited in ZMH. Moreover, 4 females, 5 males, 14 larval females, 4 eggs; 1 female, 1 male and 1 larva deposited in the USNM; 2 females, 1 male and 3 larvae deposited in the collection of RWH; balance of specimens deposited in ZMH (ZMH Reg. No. A30/1985: 14 slides with No. 429-432, 434-437, 439, 441-442, 445-447, moreover, 5 slides with ZMH No. A40/98).

ETYMOLOGY. The word *pungens* (= piercing, biting, pungent) is a present participle of the Latin *pungere* (= to sting, to prick). The name was chosen by the late Dr. H. Regenfuss.

DIAGNOSIS: *Eutarsopolipus pungens* sp. n. is easily distinguished from other members of the *myzus*-group of *Eutarsopolipus* by long cheliceral stylets in all stages. Adult females have stylets longer than 85 µm compared to stylets of less than 50 in six other species. Most males have stylets 40 µm in length compared to stylets of less than 25 in other species. Larval females have stylets longer than 55 compared to stylets of less than 40 in other species.

DESCRIPTION: ADULT FEMALE (Figs 1,2). Gnathosoma length 80-108, width 86-92. Cheliceral stylet length 87-138. Palp length 20-30; pharynx width 25-28, dorsal gnathosomal seta 29, ventral seta 10-13, distance between ventral setae 29-39. Stigmata prominent, at posterolateral margin of gnathosoma.

Idiosoma; length 425-1100, width 387-910. Prodorsal plate wider than long, setae v_1 5-8, v_2 14-19, sc_2 92-98. Distance between setae v_1 70-81; v_2 near a line connecting v_1 and sc_2. Plate C length 56, width 500, setae c_1 9, c_2 10-11, seta *d* 8. Plate *EF* length 95-125, width 230-312, seta *f* 9-10. Venter with apodemes 1 moderately developed, meeting sternal apodeme medially. Coxal setae thin, *1a* 3-7, *2a* 3-7, *3a* 8-10, *3b* 7-8. Distance between setae *1a* 52-72, distance between setae *2a* 70-93, distance between setae *3a* and *3b* 36-38. Setae h_1 30, no setae h_2. Legs: leg setation as in Table 1. Ambulacrum I, II, III with prominent claws. Femur I seta *l'* 18-21. Single tarsus I spine, 2 terminal spines on each of tarsi II, III. Tarsus I solenidion ω 5-6. Tibia I solenidion ϕ 7-10. Seta *k* 2-5. Setae *d* tibia I 58, tibia II 12, tibia III 30.



Figs 3-4. *E. pungens* sp. n.: 3 - male, ventral and dorsal aspects; 4 - larval female, ventral and dorsal aspects.

MALE (Figs 3, 5). Gnathosoma length 52-55, width 49-52. Cheliceral stylet length 38-42, palp length 12-16; pharynx width 13-15, dorsal gnathosomal seta 11-13, ventral seta 3, distance between ventral setae 20-21. Idiosoma; length 270-278, width 198-248. Prodorsal plate setae v_1 2-7, v_2 11-12, sc_2 84-90. Setae c_1 7-9, c_2, 7-10, *d* 7-8. *Short* setae h_1 evident in some specimens. Venter with apodemes 1 and 2 moderately developed, meeting sternal apodeme medially. Coxal setae thin, *1a* 2, *2a* 2-3. Coxal setae *3a, 3b* daggerlike, *3a* 8, *3b* 5-6. Legs: leg setation as in Table 1. Ambulacrum I with one claw, ambulacra II, III with short thick claws. Single tarsus I spine, 2 terminal spines on each of tarsi II, III. Tarsus I solenidion ω 4-5. Tibia I solenidion ϕ 7. Seta *k* 2-3. Tibia I seta *d* 44-50, tibia II seta *d* 9-10, tibia III setae *d* 5-8. Femur I setae *l'* stout, 8-9.

LARVAL FEMALE (Fig. 4). Gnathosoma length 55-65, width 60-77. Cheliceral stylet length 58-68. Palp length 15-20; pharynx width 17-23, dorsal gnathosomal seta 17-18, ventral seta 4-6, distance between ventral setae 20-41. Idiosoma; length 208-263, width 151-222. Setae v_1 2-4, v_2 10-12, sc_2 115. Distance between setae v_1 32-50; distance between setae sc_2 90-123. Setae c_1 7-8, c_2 7-10, *d* 8-10, *f* 8-12. Venter with apodemes 1 and 2 poorly developed, meeting sternal apodeme medially. Coxal setae *1a* 2-3, *2a* 2-3, *3a* 10-11, *3b* 7-8; setae *3a, 3b* daggerlike. Distance between setae *3a* and *3b* 31-36. Setae h_1 182, h_2 39-48. Distance between setae h_1 2-7. Legs; setation pattern as in the male. Ambulacra I, II, III with short claws. Single tarsus I spine, 2 terminal spines on each of tarsi II, III. Tarsus I solenidion ω 4-5. Tibia I solenidion ϕ 6-8, seta *k* 2-4. Tibia I seta *d* 50-60, tibia II setae *d* 6-12, tibia III seta *d* 8-11.

EGG. Length 290-374, width 168-220.

Remarks

SMALL MALES (Fig. 5). Small and large males of the same species are observed in many genera and species of Podapolipidae. They are ususally mentioned briefly or ignored in species descriptions of podapolipid mites. It is not known whether small size is related to variation in nutrition available to developing embryos or to genetic or other factors. Cheliceral stylet lengths and aedeagal sizes may be similar in small and large males or may be markedly different, as in *E. pungens* sp. n. Selected measurements of small and large males appear in Table 2. Since there are no small larval or adult females with striking differences in cheliceral stylet lengths or differences in other characters of these stages from the same host beetle, it is unlikely that males with cheliceral stylets 20 µm represent a different species than males with cheliceral stylets 40 µm. One specimen has cheliceral stylets 30 µm but an aedeagus which, in size, is characteristic of larger males. Small males are included here in an attempt to stimulate thoughts about this phenomenon.

Discussion

Regenfuss (1968) defined the *myzus*-group of species in the genus *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

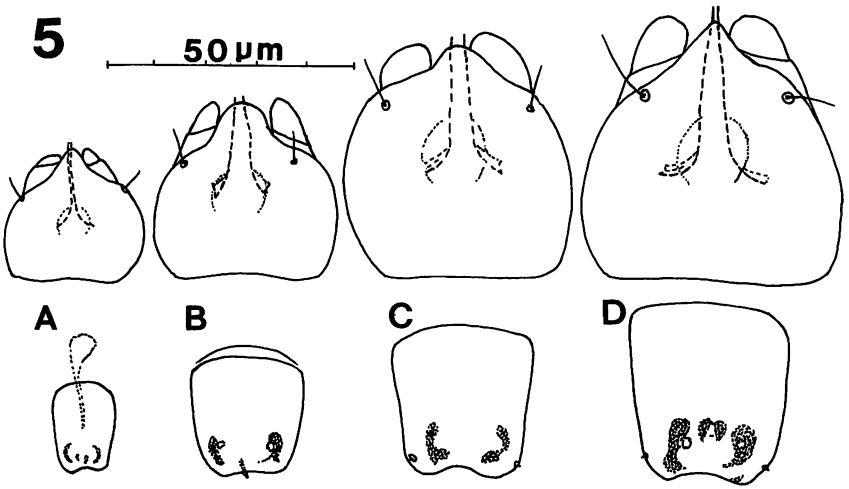


Fig. 5. *E. pungens* sp. n., comparison of gnathosomas and aedeagi of 4 males: A - from Helen, Georgia (A30/1985-446); B - from Athens, Georgia (RWH 32298-5); C and D - from Athens, Georgia (RWH 31598-1 and A30/1985-443, respectively).

did not find this in larval females of *E. pungens* sp. n. He describes the aedeagus of *E. myzus* as longer than wide with concave sides. *E. pungens* sp. n. has aedeagi longer than wide but sides are nearly parallel. Males and larvae have long femoral I setae *l'* (6-10) as in the females (18-21). However, ambulacral claws II, III are small in males and larval females. The following key to the species groups of *Eutarspolipus* is based on adult female characters established by Regenfuss (1968). The *ochoai*-group based on *E. ochoai* Husband, 1995 is included.

Key to the species groups of *Eutarsopolipus*

1. Without leg II, III claws 2

- With leg II, III claws 4

2. Stigmata and trachea evident, plates *C, D* present 3

- Stigmata and trachea not evident, plates *C, D* not present ..... *stammeri*

3. Strong claw on leg I, with genu III seta, femur I seta *l'* long (15 µm) or longer ..... *acanthomus*

- No strong claw on leg I, without genu III seta, femur I seta *l'* short (1-5 µm) ... *biunguis*

4. Without genu III seta 5

- With genu III seta ..... *ochoai*

5. Femur I seta *l'* short, less than 10 µm 6

- Femur I seta *l'* long, 11-21 µm ..... *myzus*

6. Setae v_1, v_2 as long as infundibulum or longer 7

- Setae v_1, v_2 vestigial ..... *lagenaeformis*

7. Stigmata and trachea not prominent ..... *pterostichi*

- Stigmata and trachea prominent ..... *desani*

Included in the *myzus*-group are: *Eutarsopolipus myzus* Regenfuss, 1968, *E. abdominis* Regenfuss, 1968, *E. squamorum* Regenfuss, 1968, *E. thoracis* Regenfuss, 1968 and *E. poecili* Regenfuss, 1968. *Eutarsopolipus quebecensis* Husband, 1998 and *E. pungens* sp. n. are in the *myzus*-group. Regenfuss illustrated male and larval *E. myzus* but we were unable to find males or larvae in the collection. Regenfuss (1968) stated that male and larval female *Eutarsopolipus* in the *myzus*-group are difficult to determine. In the keys to species of the myzus group, we follow Regenfuss in using characteristic shapes of adult females to distinguish species.

Key to adult females in the *myzus*-group of *Eutarsopolipus*

1. Cheliceral stylets shorter than width of gnathosoma, shorter than 50 µm 2

- Cheliceral stylets longer than width of gnathosoma, longer than 85 µm ..... *E. pungens* sp. n.

2. Propodosoma does not cover the gnathosoma 3

- Propodosoma covers the gnathosoma ..... *E. poecili* Regenfuss

3. Without wrinkled opisthosomal lobes; if lobes, then lobes not equal to size of gnathosoma 4

- With wrinkled opisthosomal lobes, lobes equal in size to gnathosoma .... *E. quebecensis* Husband

4. Idiosoma broadest at or posterior to the plane of plate *D* 5

- Idiosoma broadest at or slightly posterior to the plane of plate *C* 6

Table 1. Leg setation for femora (F), genua (G), tibiae (Ti), tarsi (Ta) for *Eutarsopolipus myzus*, *E. quebecensis*, *E. pungens* sp. n. and *Dorsipes evarthrusi*

Species	Leg I				Leg II				Leg III			
	F	G	Ti	Ta	F	G	Ti	Ta	F	G	Ti	Ta
myzus-group												
E. myzus	2	0	7	8	0	0	4	7	0	0	4	6
E. quebecensis	2	0	6	9	0	0	4	6	0	0	4	5
***E. pungens* sp. n.**	2	0	7	9	0	0	4	7	0	0	4	6
platysmae-group of *Dorsipes*												
D. evarthrusi	3	3	7	9	1	2	4	6	1	1	4	5

Table 2. Selected measurements of small (slides A30/1985-446, RWH32298-5) and large (RWH31598-1, A30/1985-443) male *Eutarsopolipus pungens* sp. n.

Character	A30/1985-446	RWH32298-5	RWH31598-1	A30/1985-443
Idiosoma length	160	168	250	272
Aedeagus length	18	26	30	36
Aedeagus width	13	22	28	32
Cheliceral stylet	20	22	30	42
Pharynx width	7	10	13	15
Setae:				
Dorsal gnathosomal	6	5	10	11
Plate *C* setae c_2	m	3	6	9
Plate *EF*, setae *f*	m	3	5	8
Femur I *l'*	3	2	_	9
Tibia III *v'*	2	2	3	6

5. Idiosoma broadest posterior to legs III ..... *E. thoracis* Regenfuss

- Idiosoma broadest anterior to legs III ..... *E. squamorum* Regenfuss

6. Caudal to the posterior margin of plate *D*, the idiosoma expands laterally ..... *E. myzus* Regenfuss

- Caudal to the posterior margin of plate *D*, lateral margins of the idiosoma are parallel ..... *E. abdominis* Regenfuss

Variability in *E. pungens* sp. n. was noted above in the discussion of small and large males. Another striking observation was the presence of left and right femur III setae *v'* 5 µm in length in one otherwise normal male specimen (ZMH A30/1985-444). More than 30 species of *Eutarsopolipus* have been described. No male, adult or larval female *Eutarsopolipus*, *Ovacarus* or *Regenpolipus* has femur III seta *v'*. This seta is present in species in the genus *Dorsipes*, as noted for *Dorsipes evarthrusi* Husband & Rack, 1991, collected in the same region of Georgia as *E. pungens* sp. n. This observation emphasizes the need for numerous and careful measurements if variability in the mite family Podapolipidae is to be detected and eventually understood.

Acknowledgments

The authors are grateful to 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.

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