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A NEW *EUTARSOPOLIPUS* (ACARI: PODAPOLIPIDAE); PARASITE
OF *HARPALUS HERBIVAGUS* (COLEOPTERA: CARABIDAE)
FROM MICHIGAN¹

Robert W. Husband²

ABSTRACT

Eutarsopolipus porteri n. sp. (Acari: Podapolipidae) is described from *Harpalus herbivagus* and *E. elongatus* is reported for the first time in North America from *Amara aenea* (Coleoptera: Carabidae) from Fort Custer State Recreation Area, Kalamazoo County, Michigan. Of the 7 species of Podapolipidae known from American Carabidae, *E. elongatus* was introduced with *Amara aenea* and the others are native species. All are parasites restricted to Carabidae.

Lindquist (1986) placed Podapolipidae adjacent to Tarsonemidae within the Tarsonemoidea (Heterostigmata). In adaptation to a parasitic mode of life, podapolipids exhibit very unusual characters. These include loss of 1 to 3 pairs of legs in females, migration of the aedeagus to a posterior, middorsal or anterior position and loss of leg setation. Podapolipid mites which are parasites of carabid beetles were considered to be among the most primitive podapolipid mites by Regenfuss (1973), Eickwort (1975) and Husband (1991). Six species of podapolipid mites have been described from North American Carabidae. These species have been assigned to three genera, *Ovacarus*, *Eutarsopolipus* and *Dorsipes*. Stannard and Vaishampayan (1971) described *Ovacarus clivinae* from oviducts of *Clivina impressifrons* LeConte from Illinois. Husband (1974) described the second species, *Ovacarus peellei* from the oviducts of *Pasimachus elongatus* LeConte from North Dakota. Regenfuss (1974) described *Eutarsopolipus latus* from beneath the elytra of *Chlaenius aestivus* Say and *E. inermis* from *Evarthrus furtiva* LeConte from Georgia. Husband and Swihart (1986) described *E. regenfussi* from *Chlaenius pennsylvanicus* Say from Michigan. Husband and Rack (1991) described *Dorsipes evarthrusi* from *Evarthrus americanus* Dejean from Georgia. Studies are continuing on undescribed *Eutarsopolipus* from Canada and the Eastern United States collected by the author or obtained from E. E. Lindquist (Biosystematics Research Centre, Ottawa, Canada) and G. C. Eickwort (Dept. of Entomology, Cornell Univ., Ithaca, NY). The present paper deals with two species of *Eutarsopolipus* associated with carabid beetles collected in pitfall traps in Western Michigan by Lee Williams and T. Wayne Porter.

Utilizing characters from Regenfuss (1968 and 1974), the mites removed from two host individuals were determined to be *E. elongatus* (Regenfuss 1968) which had been described from the vicinity of Erlangen, Germany and a

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new species related to *E. elongatus* and *E. pseudopus* Regenfuss 1974. This species is described and compared with related species.

METHODS AND MATERIALS

Beetles trapped in cans containing ethylene glycol were individually inspected for mites, then flushed with 70% ethanol to remove remaining mites. More than 20 mites, with all stages represented, were removed from one hind wing base of one beetle. Two mites were removed from a second beetle. Some specimens were placed in lactic acid for clearing before mounting. Long setae are often broken, reflexed and not in horizontal positions in preparations of podapolipid mites. Measurements included in this paper are of entire setae. Mites were examined, drawn and measured with a Wild-Heerbrug phase contrast microscope fitted with a drawing apparatus and stage micrometer. Terminology follows that of Lindquist (1986). All measurements are given in micrometers (μm).

Eutarsopolipus porteri new species

Female: (Figs. 1,2)—Dimensions as in Table 1. Gnathosoma elongate, length 44–50, width 40–41; dorsal setae 28, ventral setae 12; cheliceral stylets 40–42. Idiosoma—Length 470–490, width 263–312. Stigmata near anterolateral margin of prodorsal shield, tracheal branches meet medially to form a V under anterior margin of prodorsal plate. Setae v_1, v_2 vestigial, length at most 1/2 width of setal socket. Setae sc_2 39, extending well beyond posterior border of prodorsal plate. Plate C length 80–85, width 240–252; setae c_1 13, c_2 microsetae. Plate D length 73, width 206, seta d 8. Plate EF length 49, width 180; setae f 3. Venter with apodemes heavily sclerotized, apodemes 1 meet at anterior margin of sternal apodeme, apodemes 2 meet at posterior margin of sternal apodeme. Coxae III separated. Setae h_1 10, distance between setae h_1 12.

Setal numbers, including solenidia, for legs I, II, III as in Table 2. Length of solenidion omega on leg I about 2 times width, on leg II omega length nearly equals width. Solenidion phi on leg I 9, adjacent seta k 4; seta k thick. Coxal setae $1a, 2a$ 8, lancet-like, setae originate well posterior of apodeme 1. Setae $3a$ 6, $3b$ 7. Claw on leg I prominent, no claws on legs II, III.

Male: (Figs. 3,4)—Dimensions in Table 1. Gnathosoma length 30–33, width 28–33; dorsal setae 9–11, ventral setae 5–6; cheliceral stylets 2325. Idiosoma—Length 173–183, width 122–132. Prodorsal shield wider than long, setae v_1, v_2 vestigial, setae sc_2 34. Plates CD fused, setae c, d microsetae. Genital plate length 40–47, width 40–45. Venter with apodemes 1 meeting at sternal apodeme, apodemes 2 nearly so. Coxae III separated.

Legs. Setal numbers as in Table 2. Spine-like setae on tarsi II, III well developed, claws absent. Setae $1a, 2a$ 3, both setae thin. Setae $3a, 3b$ microsetae.

Larva: (Figs. 5,6)—Dimensions as in Table 1. Gnathosoma length 35–38, width 29–34, dorsal setae 28, ventral setae 12; cheliceral stylets 30. Idiosoma—Length 168–182, width 117–142. Setae v_1, v_2 and c_2 microsetae, setae sc_2 110. Plates C fused with plate D posteromedially; setae c_1 13–18, d 11–13, both setae thick, lancet-shaped. Plate EF wider than long, setae f 9, thin and extending to posterior margin of plate EF. Apodemes 1 and 2 meet sternal apodeme near mid coxae II, coxae III separated. Setae h_1 180, h_2 25; distal margin of h_2 closely appressed to setae h_1 . Distance between setae h_1 19.

Legs. Leg segment setation as in Table 2. Tarsus I solenidion omega 2,

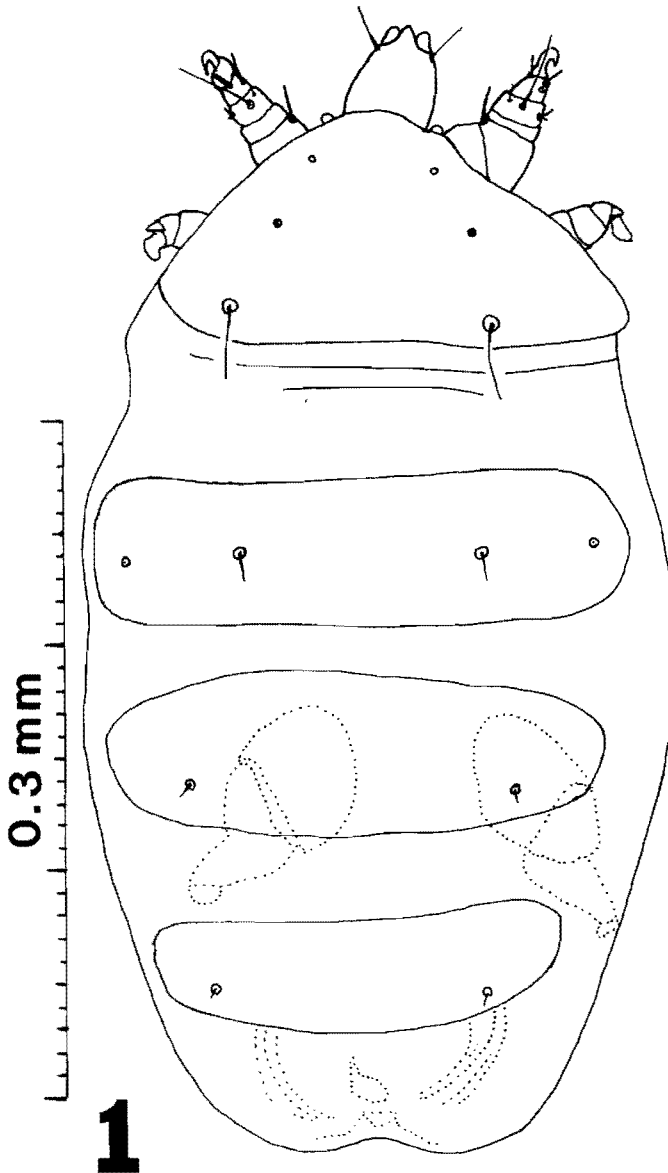


Figure 1. *Eutarsopolipus porteri* n. sp., female, dorsal.

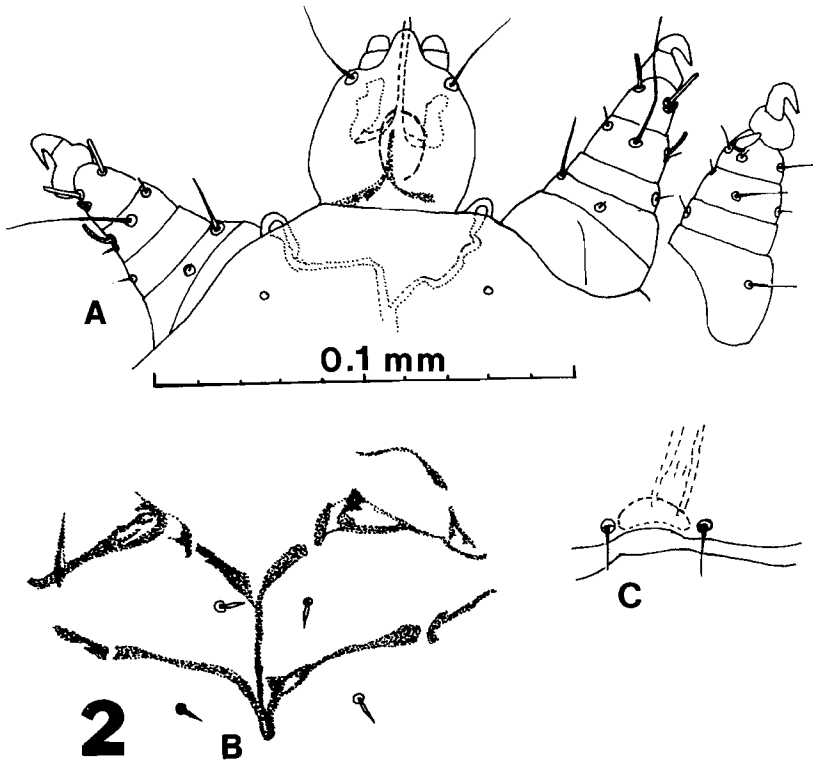


Figure 2a-c. 2a. *Eutarsopolipus porteri* n. sp., female, gnathosoma and legs I, dorsal; ventral aspect of right leg I.; 2b. *Eutarsopolipus porteri* n. sp., female, ventral, coxae I, II.; 2c. *Eutarsopolipus porteri* n. sp., female, ventral, setae h_1 .

tibial solenidion phi 8 with adjacent seta k 3. Coxal setae $1a$ 9, $2a$ 10; setae $3a$ 10, $3b$ 8. All coxal setae thick, lancet-shaped.

Type data: Holotype larva: Fort Custer Recreation Area, Twp. 2 S, Range 9 W, Sec. 23, Kalamazoo County, Michigan, from *Harpalus herbivagus* Say (Carabidae), collected 30 July 1991 by Lee Williams. Deposited in the Museum of Zoology, the University of Michigan, Ann Arbor, MI (RWH 730911-4). The type host is located in the Museum of Zoology, University of Michigan. Paratypes (3 males, 8 females, 9 larvae)-same data as holotype: 1 male (RWH 73091-1-1), 1 female (RWH 73091-1-12), 1 larva (RWH 7309101-5) deposited in the Acarology Collection of the Museum of Zoology, University of Michigan, Ann Arbor, Michigan. One male (RWH 93091-1-3), 1 female (RWH 93091-1-13), 1 larva (RWH 73091-1-6) deposited in the Zoologisches Museum, Universität Hamburg. The balance of paratypes are stored in the Acarology Collection, Biology Department, Adrian College, Adrian, Michigan. Additional specimens are stored in a vial with 70% alcohol in the Acarology Collection at Adrian College.

Etymology: The species is named for Dr. T. Wayne Porter in tribute to his

Table 1. Selected measurements for *Eutarsopolipus* spp. All measurements are in micrometers (μm). Setae designated as vestigial (v) are represented by tiny spots. Setae designated as microsetae (m) are no longer than the diameter of the setal socket. The letter T after a setal measurement indicates that the seta is conspicuously thicker than most setae. The letter t indicates somewhat thicker than most setae.

	<i>E. porteri</i>	<i>E. elongatus</i>	<i>E. pseudopus</i>	<i>E. regenfussi</i>
FEMALES				
Idiosomal length	480	515	440	300
Idiosomal width	288	270	190	192
Dorsal Gnath. setae	28	16	20	19
Vent. Gnath. setae	12	8	4	m
Cheliceral stylets	42	34	38	43
Setae v_1/v_2	v	c	m	m
Setae sc_2	39	40	10	24
Setae f	3	8	8	m
Setae $1a, 2a$	8T	5/7	5/4	m
LARVAE				
Idiosomal length	175	350	190	144
Idiosomal width	130	330	105	108
Cheliceral stylets	30	33	25	27
Dorsal Gnath. setae	28	21	18	19
Vent. Gnath. setae	12	9	4	m
Setae v_1/v_2	v	v	v	3
Setae c_1	18T	12t	5T	3
Dist. c_1-c_1	37	72	22	47
Setae d	13T	10t	5T	3
Distance $d-d$	33	42	25	30
Setae f	9	10	4	3
Coxal setae $1a$	9T	5T	7T	m
Coxal setae $2a$	10T	5T	6T	m
Coxal setae $3a$	10T	13t	10T	4
Coxal setae $3b$	8T	6T	10T	6
MALE				
Idiosomal length	178	—	180	136
Idiosomal width	127	—	115	99
Cheliceral stylets	24	—	22	22
Vent Gnath. setae	6	—	2	2
Gen. pl. midwidth	45	—	27	32
Coxal setae $1a$	3	—	m	m
Coxal setae $2a$	3	—	m	m

Table 2. Leg setation for femur, genu, tibia, tarsus for Michigan *Eutarsopolipus* and *E. pseudopus*. Solenidia are included.

	Leg I				Leg II				Leg III			
	F	G	Ti	Ta	F	G	Ti	Ta	F	G	Ti	Ta
<i>E. porteri</i>	2	2	7	8	0	1	4	6	0	1	4	5
<i>E. elongatus</i>	2	2	7	8	0	1	4	6	0	1	4	5
<i>E. pseudopus</i>	3	2	7	9	0	1	4	7	0	1	4	6
<i>E. regenfussi</i>	2	0	7	8	0	0	4	6	0	0	4	5

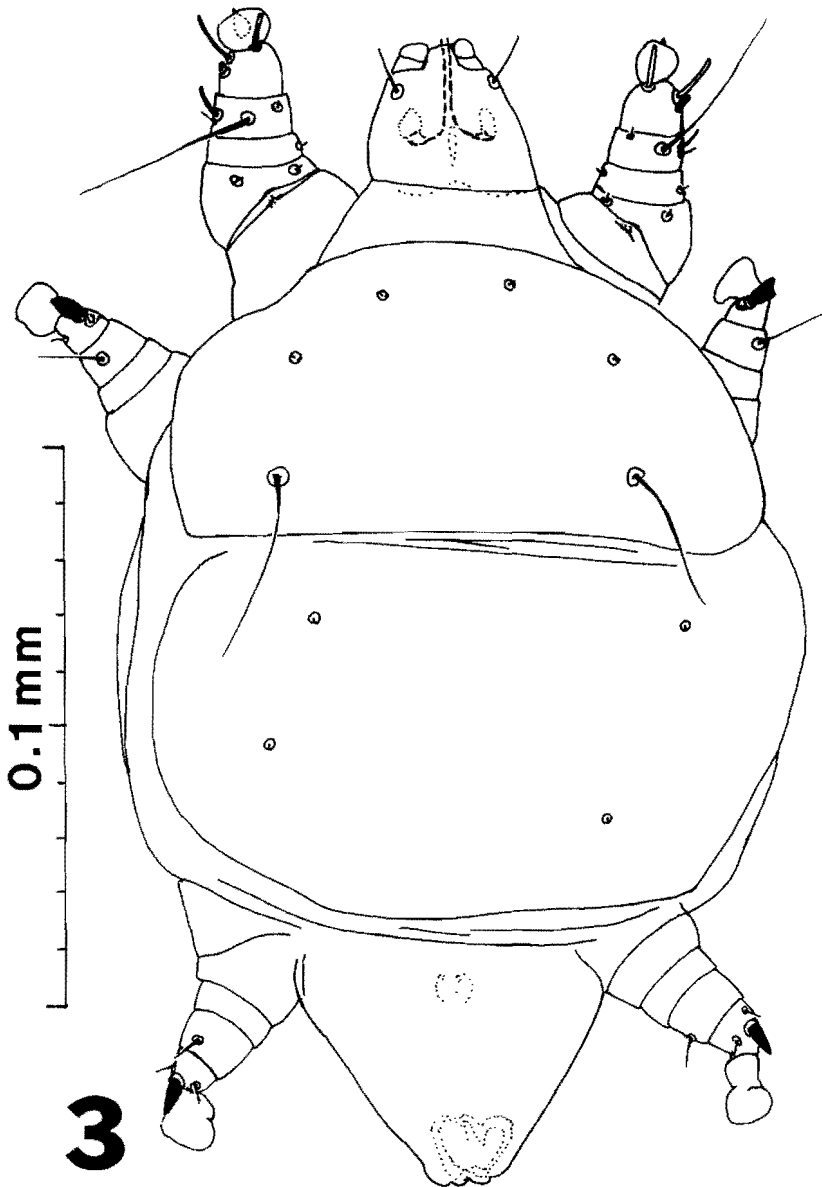


Figure 3. *Eutarsopolipus porteri* n. sp., male, dorsal.

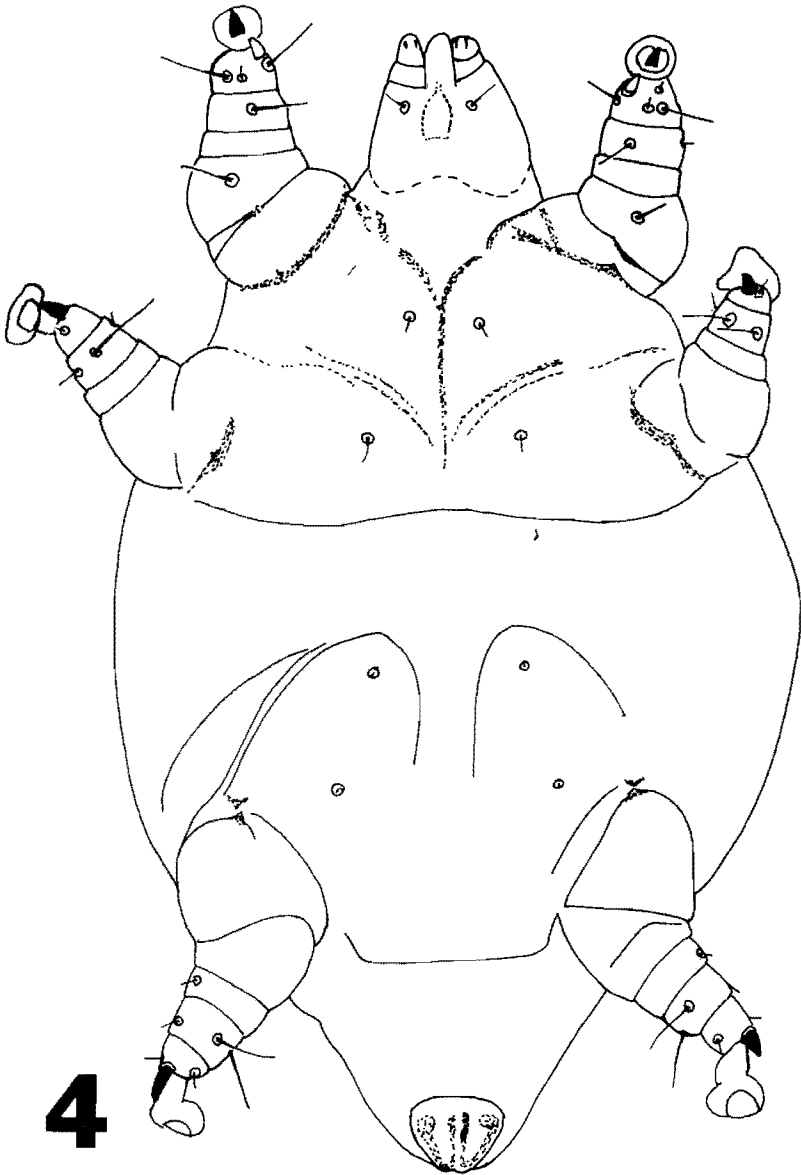


Figure 4. *Eutarsopolipus porteri* n. sp., male, ventral.

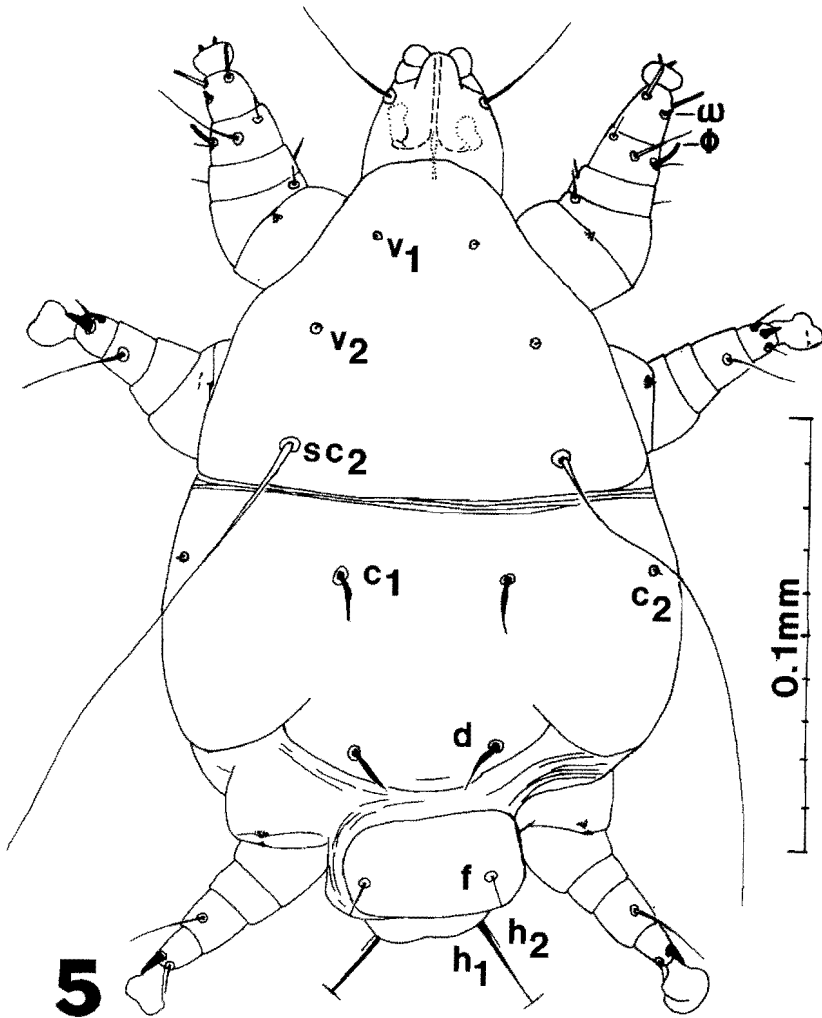


Figure 5. *Eutarsopolipus porteri* n. sp., larva, dorsal.

helping of students at W. K. Kellogg Biological Station for 37 years and in recognition of his 80th birthday on August 8, 1991.

Diagnosis: Female *E. porteri* differ from *E. elongatus* in having coxal setae 1a and 2a removed from apodemes 1 and 2. These setae are thicker than those illustrated for *E. elongatus* by Regenfuss (1974) and confirmed by comparison with local *E. elongatus*. Setae 1a and 2a are thinner than the respective setae in larval stages. Cheliceral stylets are equal to the width of the gnathosoma in *E. porteri* but are shorter in *E. elongatus*. Males of *E. elonga-*

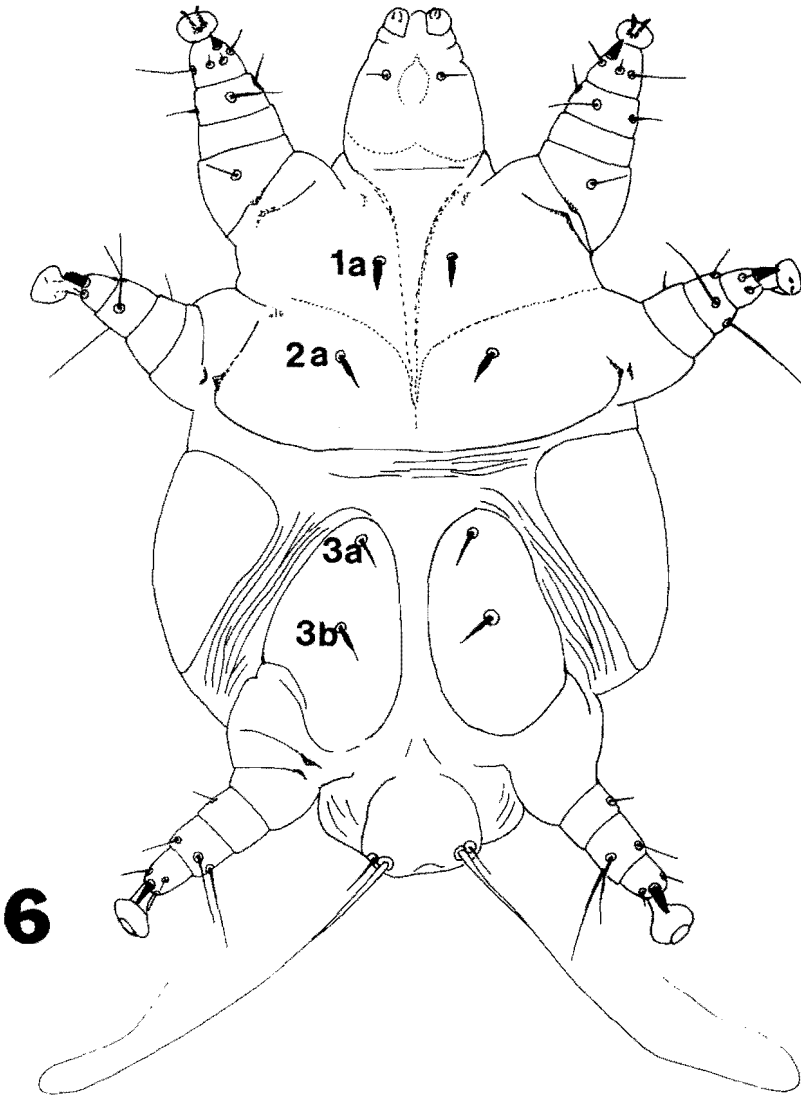


Figure 6. *Eutarsopolipus porteri* n. sp., larva, ventral.

tus are unknown. Larval *E. porteri* have longer coxal setae *1a*, *2a* and *3b* than are found in *E. elongatus* but setae *3a* are shorter. Setae *c*₁ and *d* are slightly longer and thicker in *E. porteri*.

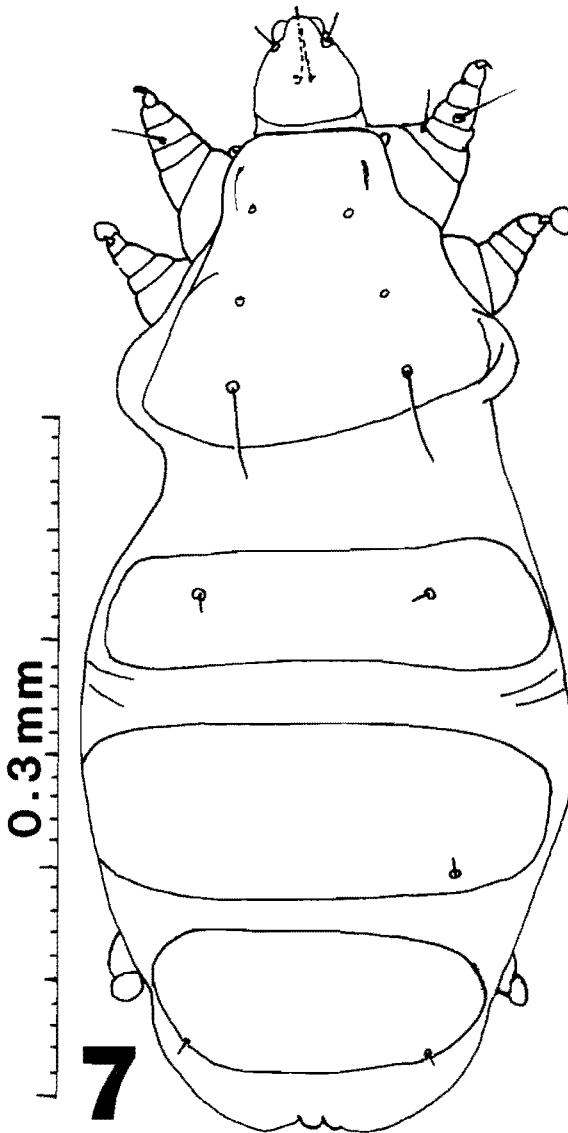


Figure 7. *Eutarsopolipus elongatus* Regenfuss, female, dorsal

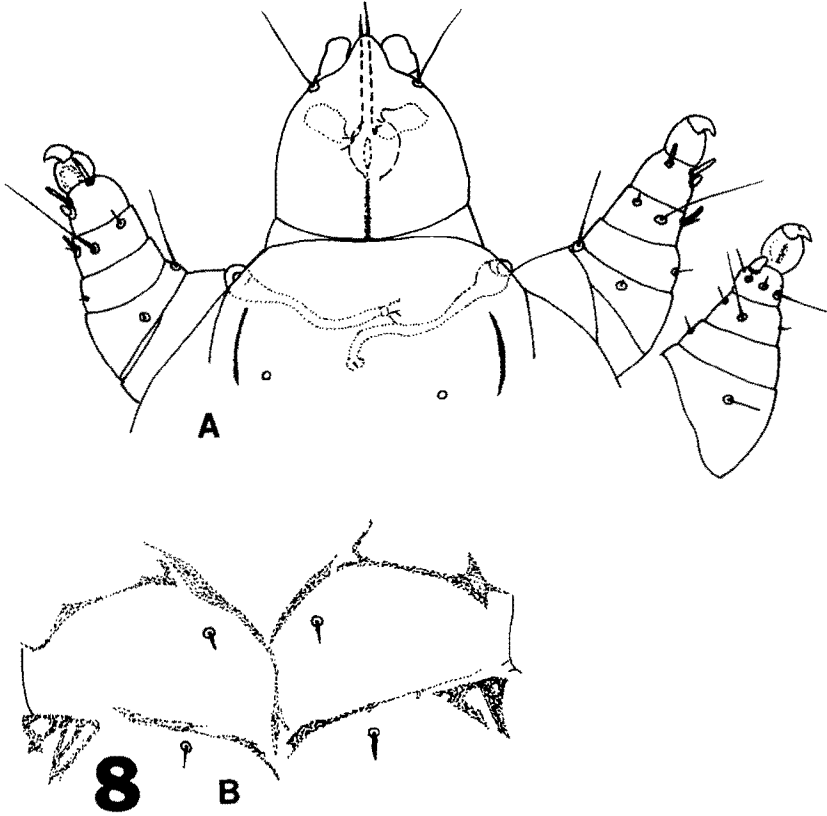


Figure 8a, b. 8a. *Eutarsopolipus elongatus* Regenfuss, female, gnathosoma and legs I, dorsal; ventral aspect of right leg I; 8b. *Eutarsopolipus elongatus* Regenfuss, female, ventral, coxae I, II.

Eutarsopolipus elongatus Regenfuss

A female and a swollen larva of *E. elongatus* were removed from *Amara aenea* DeGeer, a carabid beetle introduced from Europe. *A. aenea* is the host for *E. elongatus* in Europe. A female *E. elongatus* is illustrated by Regenfuss (1974). Both female and larval *E. elongatus* from Michigan are illustrated here for comparison with *E. porteri* (Figures 7, 8, 9). This is the first record of an introduction of a podapolipid mite from carabid beetles to North America. Since *A. aenea* is widely distributed in Michigan, the introduced mites may be encountered fairly often and a detailed description is necessary.

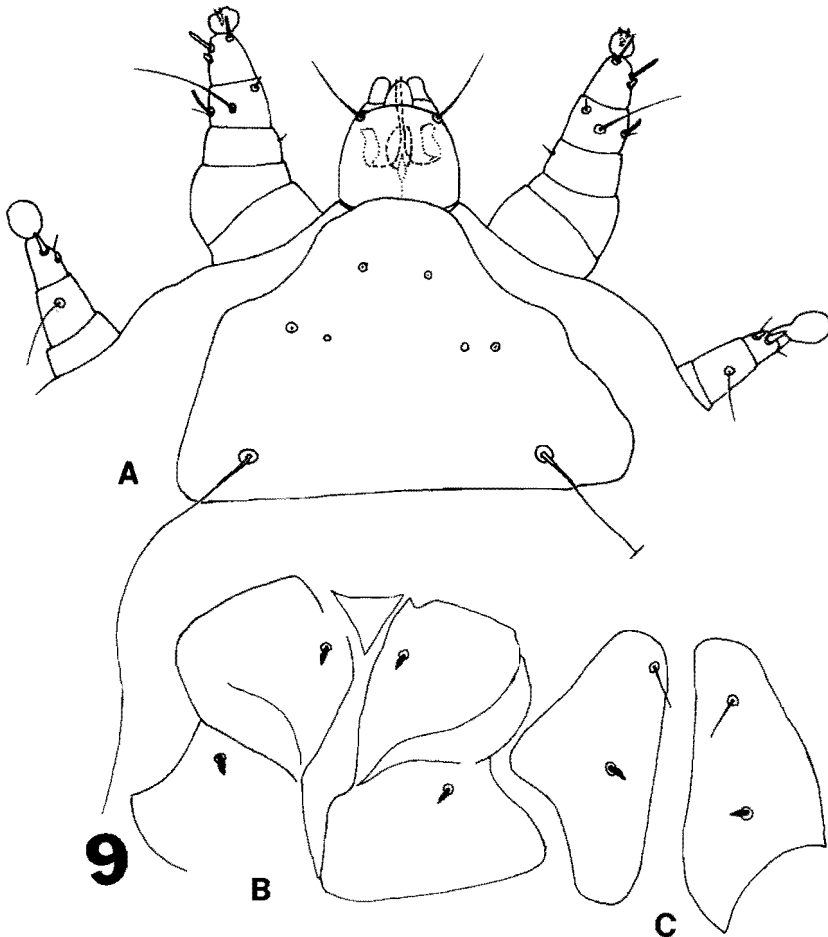


Figure 9, a-c. 9a. *Eutarsopolipus elongatus* Regenfuss, larva, dorsal, propodosoma; 9b. *Eutarsopolipus elongatus* Regenfuss, larva, ventral, coxae I, II; 9c. *Eutarsopolipus elongatus* Regenfuss, larva, ventral, coxae III.

DISCUSSION

Regenfuss (1968) utilized the following characters in assembling five *Eutarsopolipus* species into a cluster of related species: in females, (1) setae v_1 and v_2 no longer than setal socket, (2) apodeme III lacking, (3) setae sc_1 absent and (4) ambulacra II and III without claws. In addition, Regenfuss characterized this group by: (1) females with a long, stout femoral I' seta, (2) larvae with setae h_1 widely separated and (3) males with genital plate about as broad as long. The single male specimen in this group observed by Regenfuss was the male of *E. acanthomus* and it was not illustrated. Included in this group were: *E. acanthomus*, *E. alarum*, *E. assimilis*, *E. crassisetus* and *E. elongatus*.

In 1974, Regenfuss added *E. pseudopus* to this subset of the genus *Eutarsopolipus*, and *E. porteri* also shares the characteristics of this group. The other North American *Eutarsopolipus* species belong to different species groups. Regenfuss (1974) placed *E. latus* and *E. inermis*, collected in Georgia, with *E. desani* and *E. pterostichi* respectively. Husband and Swihart (1986) placed *E. regenfussi*, collected in Northern Michigan, near *E. latus*.

Within the cluster of mites that includes *E. porteri*, the new species shares the thickened larval coxal setae 1a and 2a with *E. pseudopus*, *E. elongatus*, *E. alarum* and *E. crassisetus*. *Eutarsopolipus regenfussi* is included in Tables 1 and 2 for comparison with the remaining more closely related species. The leg setal patterns for all species are not known. However, species related to *E. porteri* have a seta on genua II and III while this seta is absent in *E. regenfussi* (Table 2). Femur I in *E. pseudopus* has 3 setae in contrast to 2 for other species in this discussion. Genu I has 2 setae in *E. porteri* and relatives but none in *E. regenfussi*. Thus, common setal patterns also support the inclusion of *E. porteri* within the group proposed by Regenfuss.

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