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Eutarsopolipus obrieni n. sp. (Acari: Podapolipidae), ectoparasite of *Platynus darlingtoni* (Coleoptera: Carabidae) in Jamaica, a second species in the *brettae* group of *Eutarsopolipus*

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Abstract

Eutarsopolipus obrieni **sp. nov.** (Acari: Podapolipidae), subelytral parasite of *Platynus darlingtoni* van Emden (Coleoptera: Carabidae), collected in Jamaica, is described. Relationships in the groups of *Eutarsopolipus* with adult females without stigmata, the *pterostichi, brettae, stammeri and lukoschusi* groups, are presented and a key to the 12 species in this cluster of *Eutarsopolipus* is included.

Key words: Taxonomy, carabid beetle, insect parasite, new species

Introduction

Mites in the family Podapolipidae (Acari: Tarsonemoidea) are primarily parasites of Blattodea, Coleoptera and Orthoptera. Exceptions include *Cydnipolipus miyamotoi* Kurosa and Husband 1994, which has been collected in Japan from *Aethus indicus* (Westwood) (Heteroptera: Cydnidae), and *Locustacarus buchneri*, a widely distributed parasite on many species of *Bombus* (Hymenoptera: Apidae). Many genera are host-specific at the family level. For example, all of the *Chrysomelobia* species have hosts in the beetle family Chrysomelidae except the single specimen of *Chrysomelobia donati* Haitlinger 1989 from an African Homoptera (Seeman 2008). Likewise, all of the 70 species of *Eutarsopolipus* are parasites of carabid beetles.

Regenfuss (1968) divided the genus *Eutarsopolipus* into seven groups, and further species groups have been proposed since (Husband & Husband 2009). Constantine and Seeman (2014) describe new species in the *ochoai* group, hypothesized to be the sister group of the 13 other groups of *Eutarsopolipus.* Four of the current 13 groups are without stigmata in adult females: *pterostichi, brettae, stammeri* and *lukoschusi* groups. The *pterostichi* group contains eight species: *E. pterostichi* Regenfuss 1968, *E. vernalis* Regenfuss 1968, *E. inermis* Regenfuss 1974, *E. diunculosus* Eidelberg 1994, *E. fischeri* Husband 1998, *E. shepleyi* Husband 2007, *E. teteri* Husband and Husband 2009 and *E. osunaharae* Husband and Kurosa 2012. The new species described herein is in the *brettae* group characterized by the presence of genua I, II, III setae, prominent claws and idiosomal plates in contrast to the *stammeri* group without claws or plates. The *lukoschusi* group is without genua I, II, III setae and has a small claw I and minute claws II, III. The new species described herein is from the genus *Platynus* which is the host genus for two other species of the *pterostichi* species group. The host of *E. teteri* is *Platynus teter*, collected in Mexico, and *E. jamaicaensis* Husband and Husband 2011 is described from *P. punctus* (Darlington) from Jamaica. The new species is also from Jamaica.

On a broader scale, *E. jamaicaensis* is the only other species of *Eutarsopolipus* known from Jamaica, but it is a member of the *biunguis* group, which is characterized by adult females with stigmata and trachea, males with genital capsules with concave lateral margins, and larval females with conspicuously separated setae h_1. The carabid beetle genus *Platynus* is also host to another member of the *biunguis* species group, i.e. *E. platyni* Husband and Husband 2002, collected in Western North America, making four species and three groups of *Eutarsopolipus* with *Platynus* hosts. Keys to groups of *Eutarsopolipus* and to seven species of the *pterostichi* group were provided by Husband and Husband (2009). It is the purpose of this paper to describe a new species of *Eutarsopolipus* parasitic on *Platynus darlingtoni* in Jamaica, compare the species with a previously described species in the *brettae* group and present a key to the 12 species in the *pterostichi, brettae., stammeri* and *lukoschusi* groups which share the character no stigmata.

Methods and materials

In the process of examining species of the genus *Platynus* (Carabidae) in the collection of the University of Michigan Museum of Zoology for ectoparasitic mites, *Platynus darlingtoni* examined by the senior author from St Andrew Parish, Jamaica yielded all instars of a new species of *Eutarsopolipus* from the dorsal meso and metathorax under the elytra near wing bases. Mites were placed in 70% ethanol and later mounted on glass slides in modified Hoyer's medium for detailed studies. Measurements in micrometers (µm) were taken with the aid of a Zeiss (Jena, Germany) compound phase microscope with an ocular micrometer. Setae no longer than the diameter of the acetabulum are denoted as microsetae (m). If no remnant of a seta exists in the acetabulum, setae are designated as vestigial (v). The terminology follows Lindquist (1986). Often long setae are obscured, bent, entangled or at an angle which makes measurement difficult. Setae are at least as long as indicated.

Taxonomy

Eutarsopolipus obrieni Husband and Husband sp. nov. (Figs. 1–6)

Differential diagnosis. Adult female *E. obrieni* without stigmata or trachea, cheliceral stylets (62) shorter than stylets of *E. brettae* (85), longer than stylets of *E. stammeri* (29) and *E. lukoschi* (37), longer than all species in the *pterostichi* group (29–48) except stylets (75) of *E. osunaharae*. Adult female *E. osunaharae* lack ambulacra I, II, III claws. Adult females of *E. obrieni* have strong ambulacral claws. Gnathosomal setae *ch* (30) 1½ times longer than setae *su* (20). All instars with genua I, II, III setae l' and without coxal seta 3*a*. Male with genital capsule longer than wide, with straight lateral margins. Gnathosomal setae *ch* (9) nearly ½ length of setae *su* (17), ambulacra II, III with two thin claws, prodorsal plate setae sc_2 60, remaining idiosomal setae v-m. Larval female ambulacrum I with two claws, ambulacra II, III each with two claws 10, setae h_1 adjacent or nearly so, plate C setae c_2 (13) nearly in line with and slightly longer than setae c_1 (10). Setae v_1 (30) longer than ½ width of gnathosoma (39).

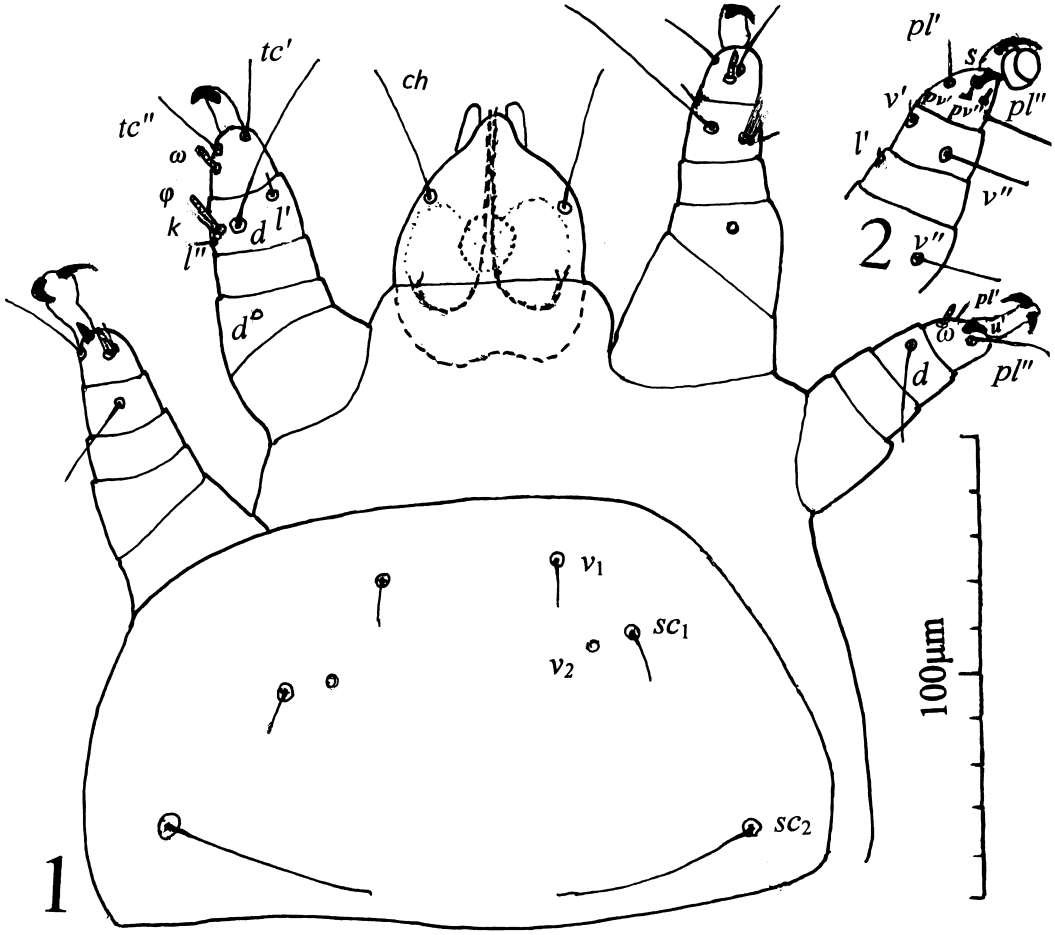
Description.

Female (Figs. 1, 2, n=4): *Gnathosoma* length 60–62, width 50–52 (Table 1). Palp length 16–18, cheliceral stylets length 62, pharynx width 15–17, dorsal gnathosomal setae *ch* 28–30, setae *su* 20. Distance between setae *su–su* 20–22. Coxal setae *1a*, 2*a*, 3*b* 7–8, in midcoxal positions, not near apodemes I, II, III.

TABLE 1. Comparison of selected maximum measurements for species of the *pterostichi* and *brettae* groups of *Eutarsopolipus*: *E. obrieni* (Eob), E. *osunaharae* (*Eos*), *E.inermis* (*Ei*), *E. pterostichi* (*Ep*) *E. teteri* (*Et*), *E. fischeri* (*Ef*), *E. shpeleyi* (*Es*), *E. diunculosus* (*Ed*) and *E. brettae* (*Eb*). All measurements are in micrometers (μm).

Character	*Eob*	*Eos*	*Ei*	*Ep*	*E.t*	*Ef*	*Es*	*Ed*	*Eb*
				ADULT FEMALES					
Idiosoma length	550	300	510	380	370	450	330	402	450
Idiosoma width	350	241	320	272	240	350	215	352	318
Gnathosomal setae									
ch	30	6	28	14	15	19	10	6	35
su	20	5	11	7	14	6	5	2	25
Gnath. width	52	48	61	52	34	46	40	42	67
Cheliceral stylets	62	75	48	46	38	34	30	25	85
Idiosomal setae									
v_1	10	10	5	6	10	6	2	3	15
sc_1	10	8	3	10	9	7	5	4	8
sc_2	45	39	20	25	60	42	34	_	30
c_1	10	7	3	9	5	5	4	4	8
c_2	11	7	5	9	7	6	5	_	10
h	0	5	0	16	0	m	4	0	0
Coxal setae 3*a*	0	+	+	+	0	+	+	+	0
Legs II, III claws	+	+	0	+	+	+	+	+	+
Femur I *v*”	18	0	0	3	15	0	v	3	14
Tibia I setae *d*	40	19	42	33	35	30	22	_	50
Tarsus I sol. ω	5	5	3	4	5	3	3	_	6
Tibia III setae *d*	20	5	9	12	13	8	8	_	22
Tarsus III *pl*”	21	10	38	10	15	17	10	7	30
				MALES					
Idiosoma length	180	161	219	155	170	162	210	164	188
Idiosoma width	142	117	168	115	137	112	155	118	147
Gnathosomal setae									
ch	9	2	12	18	5	17	5	2	4
su	17	5	3	_	8	3	3	2	13
Gnath. width	32	30	40	34	33	27	39	23	37
Cheliceral stylets	30	25	35	23	22	22	20	18	31
Gen. capsule leng.	45	28	27	27	38	38	28	32	30
Gen. cap. width	36	30	34	28	32	30	27	36	35
Legs II, III claws	5	0	0	0	5	2	0	0	3
Femur I setae *v*”	13	0	3	10	0	0	4	_	_
Tibia I setae *d*	30	10	35	_	24	19	20	_	33
Tibia III setae *d*	13	4	5	_	10	2	5	_	22
Tarsus III setae *pl*”	12	10	25	_	15	12	9	_	12
				LARVAE					
Idiosoma length	310	230	270	170	180	200	155	139	192
Idiosoma width	222	176	155	115	128	100	112	103	132
Cheliceral stylets	52	48	49	33	34	32	24	12	64
Gnathosomal setae									
ch	32	6	30	20	25	17	7	_	36
su	20	5	7	_	12	3	4	_	14
Gnath. width	20	37	30	34	30	31	30	29	45
Idiosomal setae v_1	30	10	3	_	25	17	m	_	20
sc_1	20	7	2	_	10	3	7	3	16
h_2	5	20	52	15	7	16	20	22	7
Femur I setae *v*”	18	0	0	m	10	0	3	_	14
Tibia I seta *d*	45	17	45	_	31	25	18	_	40
Tibia III setae *d*	18	5	8	_	17	5	10	_	25
Tarsus III setae *pl*”	23	10	45	_	17	13	8	_	20

*Idiosoma***.** Length 550, width 350. No stigmata. Prodorsal plate length 90, width 160, setae v_1 10, v_2 v, sc_1 10, sc_2 45. Distance v_1–v_1 26, sc_2–sc_2 122. Plate C length 70, width 170, setae c_1 10, c_2 11. Plate EF length 62, width 113, setae *e* m, no setae *h*.



FIGURES 1–2. *Eutarsopolipus obrieni* Husband & Husband sp. nov., adult female. **1**, dorsal. **2,** leg 1 ventral.

Legs. Ambulacrum I with a single thick claw 15 and sucker, ambulacra II, III with two thick claws 10. Femur I *v*" 18, genua I, II, III *v' 5*, tarsus I solenidion ω midtarsus 5, *tc*' 18, *tc*" 15, *pl*" 20. Tibia I solenidion φ 9, adjacent seta *k* 5. Tarsus II ω 5. Tibiae I, II, III setae *d* 40, 22, 20 respectively, tarsus III setae *pl*" 21. Setae per segment on femur, genu, tibia and tarsus of legs I, II, III, respectively: 2-1-7-8, 0-1-4-6, 0-1-4-5.

Male (Figs. 3, 4, n=3): *Gnathosoma* length 30–32, width 29–32. Palp length 10–12, cheliceral stylet length 30, pharynx width 10. Dorsal gnathosomal seta *ch* 8–9, ventral setae *su* 14–17, distance between *su–su* 15.

Idiosoma. Length 168–180, width 113–142. Prodorsal plate length 70, width 122. Setae v_1, sc_1 m, sc_2 52–60, distance v_1–v_1 34. Setae c_1, c_2, *d* and *e* microsetae or vestigial. Genital capsule length 36–45**,** width 30–36, lateral margins straight. Venter with apodemes weakly developed**,** apodemes II not reaching sternal apodeme medially. Coxal setae *1a, 2a, 3b* each 2–3.

Legs. Femur I seta *d* v, setae *v*" 13. Tibia I seta *d* 30, solenidion φ 8, tarsus I solenidion ω 5. Tibia II seta *d* 13, tarsus II solenidion ω 5. Tibia III seta *d* 13, tarsus III seta *pl*" 12. Ambulacrum I with one claw, ambulacra II, III with two small claws 5. Setae per leg segment of legs I, II, III as in adult female.

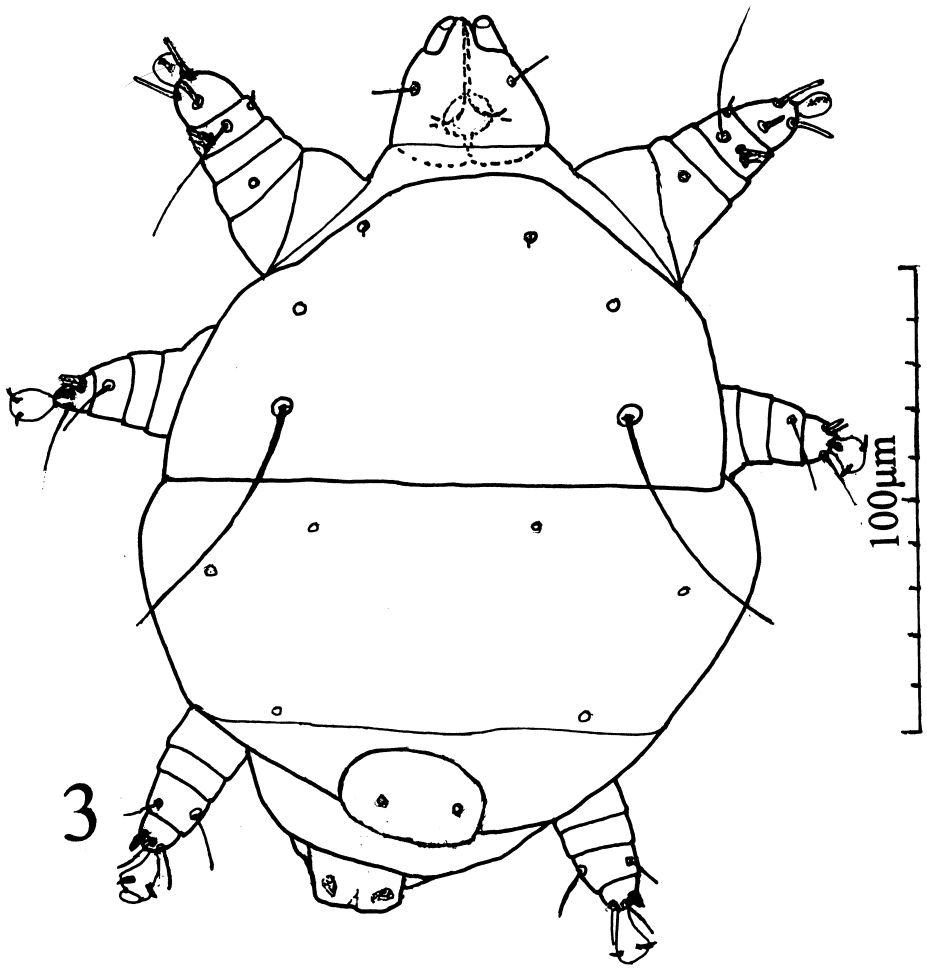


FIGURE 3. *Eutarsopolipus obrieni* Husband & Husband sp. nov., male, dorsal.

Larval female (Figs. 5, 6, n=4): *Gnathosoma* length 38–42, width 15–20. Palp length 13–18, cheliceral stylet length 41–52, pharynx width 12–16. Dorsal gnathosomal seta *ch* 22–32, ventral seta *su* 15–20. Distance between *su*–*su* 10–14.

Idiosoma. Length 186–310, width 129–222. Prodorsal plate length 78, width 102. Seta v_1 25–30, sc_1 thin 10–20, sc_2 77–84, distance between v_1–v_2 31. Setae c_1 7–10, c_2 10–13. Setae c_1 in line with setae c_2 on fused plates CD, setae *d* 4. Plate EF length 29, width 50, setae *e* 10. Plate H length 19, width 25, setae h_1 100, h_2 5. Venter with apodemes weakly developed, apodemes II not reaching sternal apodeme medially. Coxal setae 1*a* 6–7, 2*a* 4–5, 3*b* 4.

Legs. Femur I *d* m, *v*" 18, genu *l*' 3, tibia I *d* 45, solenidion φ 10, seta *k* 9. Tarsus I solenidion ω 6, tc' 12, *tc*" 12', *pl'* 10, *pl*" 15, *pv*' and *pv*" 3. Tibia II seta *d* 15, tarsus II solenidion ω 8. Tibia III seta *d* 18, tarsus III seta *pl*''23. Ambulacra I with two thin claws, ambulacra II, III each with two thin claws. Setae per leg segment of legs I, II, III as in adult female.

Egg (n=2): Length 228–249, width 118–142.

Etymology. *Eutarsopolipus obrieni* is named for Mark O'Brien, collection manager of the entomology collection of the University of Michigan Museum of Zoology, in recognition of his many years of substantial aid with acquiring access to, and providing answers to questions about, insects in the collection at UMMZ.

Type material: Holotype, adult female (RWH220310-10), from *Platynus darlingtoni* van Emden (Coleoptera: Carabidae), vicinity of Cinchona, St. Andrew Parish, Jamaica, British West Indies, 15 June 1948, coll. D. E. Miller, deposited in the University of Michigan Museum of Zoology, Ann Arbor, Michigan, U.S.A. Paratypes, three females (three slides), three males, four larval females, one slide with eggs and a larval female with same data as holotype. One adult female, one male and one larval female are deposited at the National Museum of Natural History, Washington D. C., U.S.A. The remaining paratypes are deposited with the holotype at UMMZ.

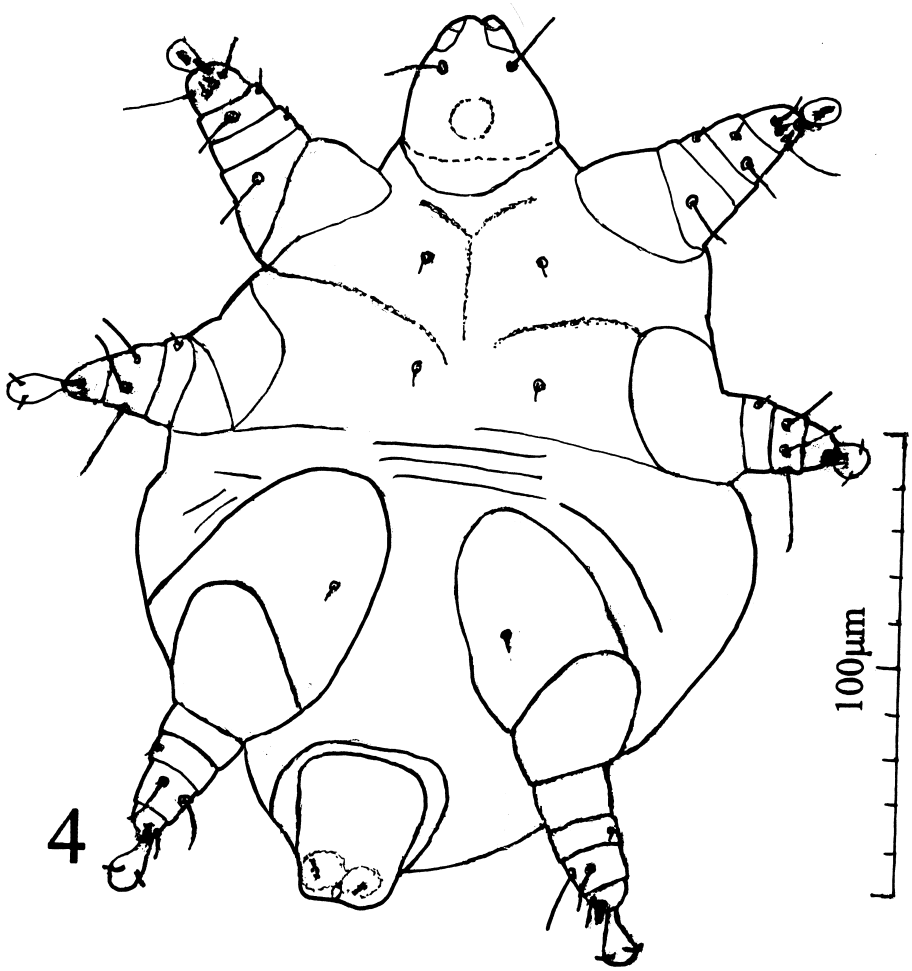


FIGURE 4. *Eutarsopolipus obrieni* Husband & Husband sp. nov., male. ventral.

Discussion

The *pterostichi* group of *Eutarsopolipus* was reviewed by Husband and Husband (2009). This publication provided keys to groups of *Eutarsopolipus*, provided keys to species within the *pterostichi* group and pointed out difficulties in placing new species in the group as defined by Regenfuss (1968). Regenfuss (1974) added *E. inermis* to the *pterostichi* group. Adult females of *E. inermis* lack ambulacra I, II, III claws. Husband and Kurosa (2012) added *E. osunaharae*, which also has adult females without claws, and included a revised key to species in the *pterostichi* group. All species in the *pterostichi*, *stammeri*, *lukoschusi* and *brettae* groups have adult females without stigmata.

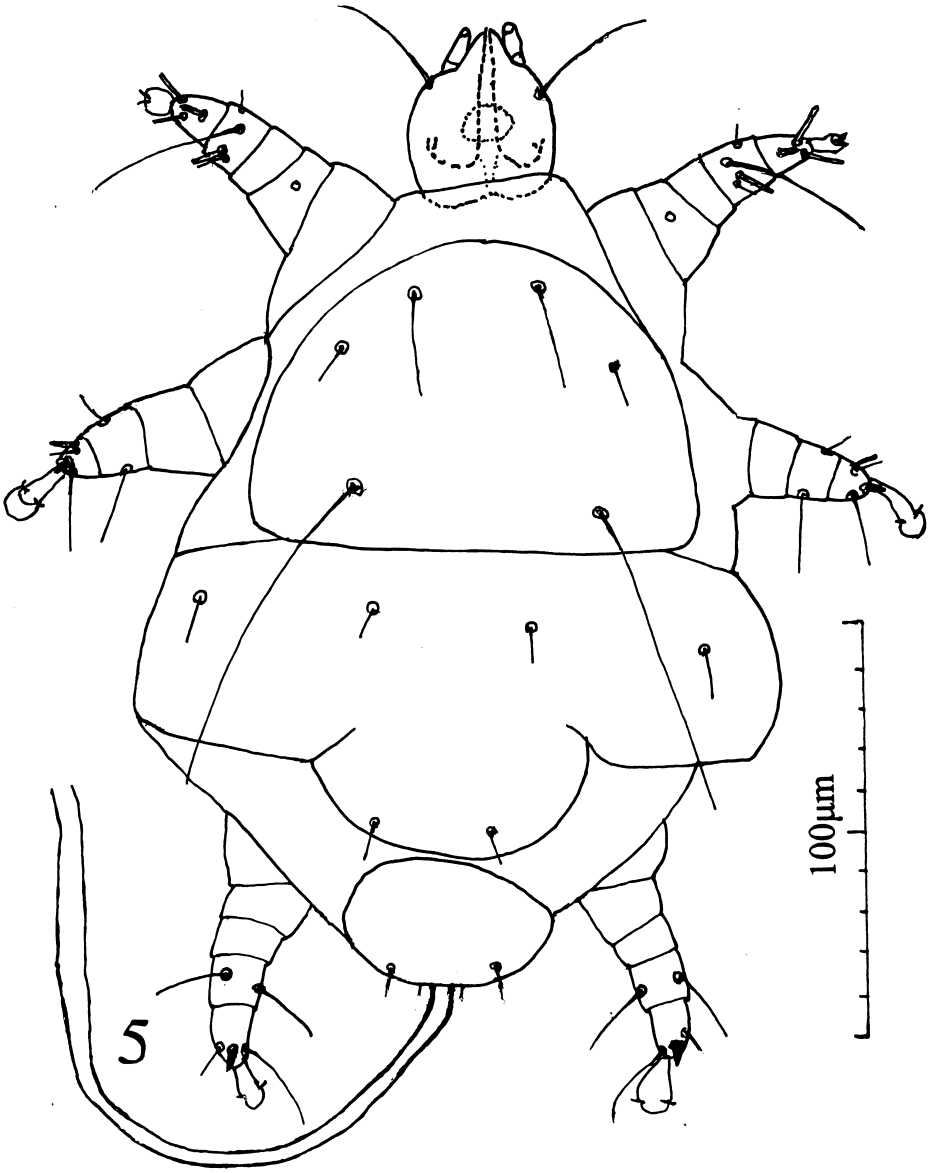


FIGURE 5. *Eutarsopolipus obrieni* Husband & Husband sp. nov., larval female, dorsal.

Adult female *E. obrieni* have long femur I setae *v*" (18) in common with females of *E. brettae* (14) and *E. lukoschusi* (10) and in contrast to femur I *v*" (0) in *E. stammeri* and 0–3 in all species in the *pterostichi* group except *E. teteri* (15) (Table 1). Stylets of *E. obrieni* (62) are shorter than stylets of *E. brettae* (85) and *E. osunaharae* (75) but longer than remaining species in the *pterostichi* group (25–48) or *E. stammeri* (29) and *E. lukoschusi* (37). Gnathosomal setae *ch* exceed 25 only in *E. obrieni* (30), *E. brettae* (35) and *E. inermis* (28). Idiosomal setae c_1 (10) are longer than c_1 setae in *E. inermis* (5) or *E. brettae* (7–8) . Two thin claws are present on ambulacra II, III of male *E. obrieni* (5), *E. brettae* (4), *E. lukoschusi* (m) as well as *E. teteri* (5) and *E. fischeri* (2) but not present in remaining species in the *pterostichi* group. Gnathosomal setae *ch* are longer in males of *E. obrieni* (9), *E. inermis* (12) and *E. pterostichi* (16) than in the remaining species in the *pterostichi group* (m-5) and in male *E. brettae* (4), *E. stammeri* (2) and *E. lukoschusi* (6). The genital capsule is distinctly longer than wide in males of *E. obrieni* (45/36), *E. teteri* (38/32) and *E. fischeri* (38/30) but wider

than long in *E. stammeri*. The lateral margins of the genital capsule of all males in the *pterostichi* group as well as the genital capsule of *E. obrieni* are straight. The genital capsules of males of *E. brettae* and *E. lukoschusi* are concave laterally. Cheliceral stylets of larval female *E obrieni* (52), *E. brettae* (64), *E. osunaharae* (48) and *E. inermis* (49) exceed 45 micrometers in contrast to lengths of stylets 12–34 in larval females of the remaining species in the *pterostichi* group as well as stylets of larval *E. lukoschuri* (21) and *E. stammeri* (19). Idiosomal setae v_1 of larval females of *E. obrieni* (30), *E. brettae* (20) and *E. teteri* (10) are longer than in remaining species in the *pterostichi* group (0–5) and in larval females of the *lukoschusi* (8) and *stammeri* (8) groups.

As many new species of *Eutarsopolipus* are discovered and described from many of the 34,275 species of Carabidae (Lorenz, 2005), groups of the current 70 species of *Eutarsopolipus* will be revised in the future.

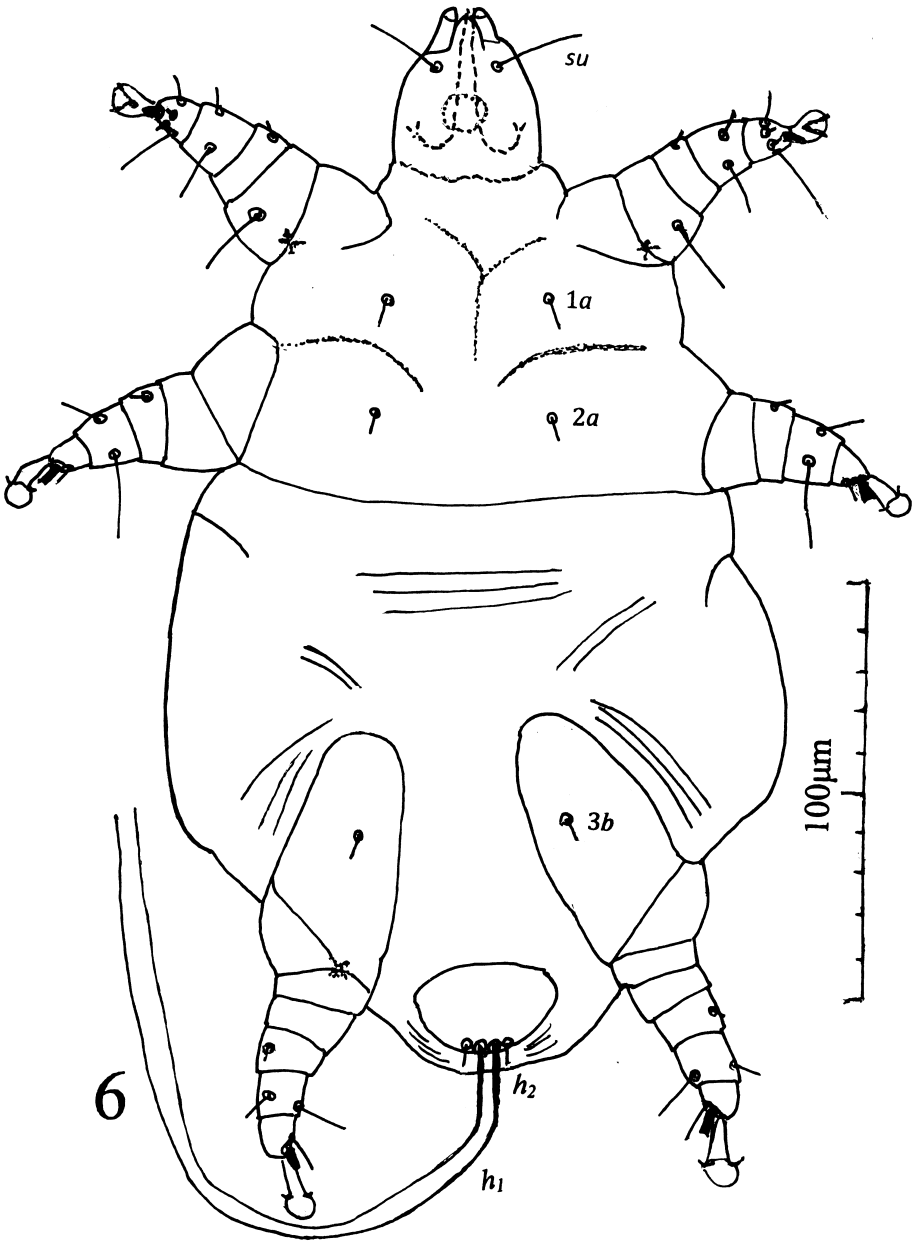


FIGURE 6. *Eutarsopolipus obrieni* Husband and Husband sp. nov., larval female, ventral.

Key to adult females of *Eutarsopolipus* without stigmata

1 With one ambulacrum I claw 2
- With two ambulacrum I claws, host genus *Dyschirius*, Moldova, Ukraine . . . . . *Eutarsopolipus diunculosus* Eidelberg
2 Without coxal seta 3*a* 3
- With coxal seta 3*a*. 5
3 Cheliceral stylets less than 65 4
- Cheliceral stylets 85, host genus *Agonum*, Galapagos Islands. . . . . *Eutarsopolipus brettae* Husband
4 Cheliceral stylets 62, , gnathosomal setae *ch* (30) 1 ½ longer than *su* (20), host genus *Platynus*, St. Andrew Parish, Jamaica . . . . . *Eutarsopolipus obrieni* Husband and Husband sp. nov.
- Cheliceral stylets 38, originating in mid gnathosoma, gnathosomal setae *ch* (15) nearly equal to setae *su* (14), host genus *Platynus*, Chiapas, Mexico . . . . . *Eutarsopolipus teteri* Husband and Husband
5 With plates C, D, with femur I setae 6
- Without plates C, D, without femur I setae, host genus *Pterostichus*, Ebermannstadt, Germany . . . . . *Eutarsopolipus stammeri* Regenfuss
6 Ambulacra I, II, III with claws 7
- Ambulacra I, II, III without claws, host genus *Evarthrus*, Georgia, U. S. A. . . . . *Eutarsopolipus inermis* Regenfuss
7 Setae c_1 mid to posterior on plate C, sc_2 short to long, ambulacra I claws as long as or longer than spine-like tarsi I setae *s*. 8
- Setae c_1 near anterior border of plate C, sc_2 12, ambulacra claws I shorter than spine-like tarsi setae *s*, host genus *Thermophilum*, South Africa . . . . . *Eutarsopolipus lukoschusi* Husband
8 Cheliceral stylets shorter than 70 (25–62) 9
- Cheliceral stylets 75, longer than width of gnathosoma (48), gnathosomal setae *ch* short (6), setae *h* 5, host genus *Diplocheila*, Chiba and Fukuoka Prefectures, Japan *Eutarsopolipus osunaharae* Husband & Kurosa
9 Setae h_1 (0–4) shorter than ½ distance between setae h_1 (12–25). 10
- Setae h_1 (15–16) nearly equal to distance between setae h_1 (15–21), host genus *Pterostichus*, Germany, Hungary, Poland, Russia, Ukraine . . . . . *Eutarsopolipus pterostichi* Regenfuss
10 Dorsal gnathosomal setae *ch* (10), two times length of ventral gnathosomal setae *su* (5) 11
- Dorsal gnathosomal setae *ch* (19) three times length of ventral gnathosomal setae *su* (6), host genus *Harpalus*, Michigan, U. S. A.. . . . . *Eutarsopolipus fischeri* Husband
11 Plate C setae c_1 (10) 1/2 width of base of tarsus I, host genus *Pterostichus*, Germany, Ukraine . . . . . *Eutarsopolipus vernalis* Regenfuss
- Plate C setae c_1 (4) less than ½ width of base of tarsus I, host genus *Pterostichus*, Michigan, U.S.A . . . . . *Eutarsopolipus shpeleyi* Husband

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