Description of *Gamasellus onitiae* sp. nov. (Ologamasidae: Mesostigmata) from Dung Beetle, *Onitis philemon* (Coleoptera: Scarabaeidae)[1]

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Abstract *Gamasellus onitiae* sp. nov. (Ologamasidae: Mesostigmata) has been identified and described after being been collected from a dung beetle, *Onitis philemon* (Scarabaeidae, Coleoptera), in India. The specimen was found to be attached via a claw to the head region of the beetle. The mite–beetle association appeared to be phoretic. The distal setae, ventral setae, sternal shield length, and peritreme of *G. onitiae* sp. nov. differ from those of the closely related *Gamasellus falciger* (G. Canestrini & R. Canestrini), *Gamasellus deepdelensis* (Ryke), *Gamasellus racovitzai* (Jumeau and Usher), and *Gamasellus bellavistae* Emberson.

Key Words dung beetle, head region, claw, distal setae, peritreme

More than 60 species have been classified under the genus *Gamasellus* Berlese, which is a member of the family Ologamasidae (order Mesostigmata). Important characters of the *Gamasellus* genus are: (a) the dorsal shield will enfold the ventral surface without combining with ventrianal shield; (b) the setae of the legs can be simple or complex; (c) it is ubiquitous in nature, as noted by Pérez-Martínez et al. (2019); and (d) it has a phoretic relationship with insects, attaching to the host wings (Camerik 2010, Farish and Axtell 1971). Szymkowiak et al. (2007) postulated that the phoretic behavior enhances survival as well as expands its geographic distribution. Perotti et al. (2010) also reported that phoretic attachment is often facilitated by specialized structures for attachment to the host insect. Usher and Bowring (1984) observed that *Gamasellus racovitzai* (Jumeau and Usher) is a terrestrial predator and is distributed in various habitats with mossy places. It is apparent that there are several species in this genus that remain undescribed; this study was conducted with a heretofore undescribed species in Tamil Nadu, India.

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Table 1. Chaetotaxy measurements of *Gamasellus onitiae* sp. nov.

No.	Characters	Range (μm)	Mean* (μm)	Standard Deviation	Standard Error
1	Dorsum–idiosoma length	805–813	810	2.24	0.71
2	Dorsum–idiosoma width	577–583	580	2.45	0.77
3	Setae S_5 length	176–185	180	2.49	0.79
4	Ventrum–sternal shield length	372–380	375	3.07	0.97
5	Ventrum–sternal shield width	197–202	200	1.90	0.60
6	Sternal shield seta 1	53.5–57	55	1.05	0.33
7	Sternal shield seta 2	64.5–66	65	0.71	0.22
8	Sternal shield seta 3	53.5–56	55	1.02	0.32
9	Sternal shield seta 4	48.5–51.5	50	0.92	0.29
10	Sternal shield seta 5	69–71	70	0.77	0.24
11	Genital shield length	113.5–116	115	0.89	0.28
12	Genital shield width	118.5–121.5	120	0.81	0.25
13	Leg I	698–701.5	700	1.40	0.44
14	Leg II	594–597.5	595	1.05	0.33
15	Leg III	668.5–672	670	1.06	0.34
16	Leg IV	743–747	745	1.12	0.35
17	Gnathosoma length	338–341.5	340	1.02	1.22
18	Gnathosoma width	197.7–202	200	0.32	0.39

* Mean of 10 mite specimens.

Materials and Methods

The host insect, a dung beetle identified as *Onitis philemon* (Scarabaeidae, Coleoptera), was collected from Tamil Nadu. An examination revealed that a mite was attached to the head region of the dung beetle. The attachment was facilitated by a strongly inclined tarsal claw. The mite specimen was cleared and the slide mounted for examination and taxonomic identification using Krantz (1968). Drawings were rendered with camera lucida, and the measurements are in micrometers. Voucher slides have been retained in the collection curated by V.R. in the Department of Entomology, Acarology Laboratory, Tamil Nadu Agricultural University, Coimbatore, India.

Results and Discussion

Ten dung beetles with 10 to 15 mites attached to the ventrum of the head region were collected and provided mite specimens for this study. Ten mite slides

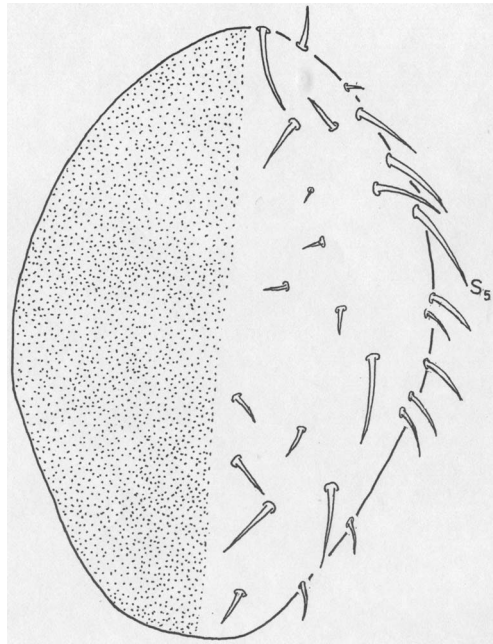

Fig. 1. Dorsum of *Gamasellus onitiae* sp. nov.

(one mite specimen mounted per beetle) were prepared for microscopic observation as well as taxonomic drawings. The chaetotaxy measurements from the 10 mites are listed in Table 1. The slide-mounted mite specimens were identified to the genus *Gamasellus*, but the species could not be confirmed. It was, thus, deemed to be an undescribed species of *Gamasellus*. The description of the species is given below.

Taxonomic Description

Genus: ***Gamasellus*** Berlese, 1892

Gamasellus onitiae sp. nov. (Figs. 1–5)

Male dorsum. Idiosoma 810 long and 580 wide; 27 pairs of setae arise from the dorsum and length ranges from 25 to 115. The arrangement and chaetotaxy of dorsal setae are shown in Fig. 1. Ornamentation is represented as sparse dots on the figure. The setae are smooth and long; setae S_5 are longer than other setae (180) (Table 1).

Venter. Sternal shield narrow, well developed, 375 long, 200 wide, with five pairs of setae 55, 65, 55, 50, and 70 long from anterior to posterior. First and third setae are equal in length. The sternal shield is larger in outline and subequal in length and width. In addition, the genital shield is 115 long and 120 wide (Table 1), with two paranal setae and an adanal seta (Fig. 2). Two pairs of setae arise between

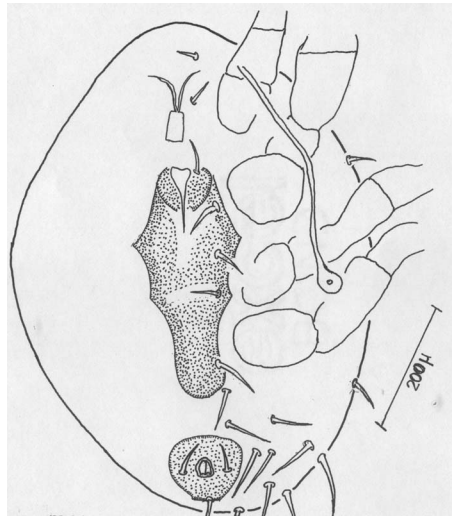

Fig. 2. Ventrum of *Gamasellus onitiae* sp. nov.

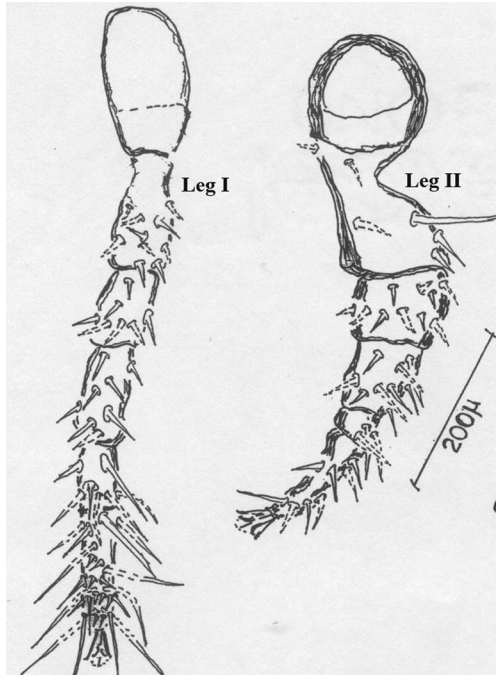

Fig. 3. Legs I, II of *Gamasellus onitiae* sp. nov.

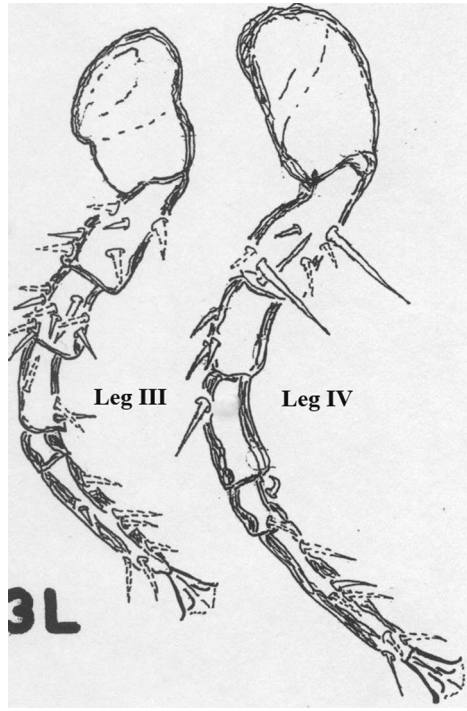

Fig. 4. Legs III, IV of *Gamasellus onitiae* sp. nov.

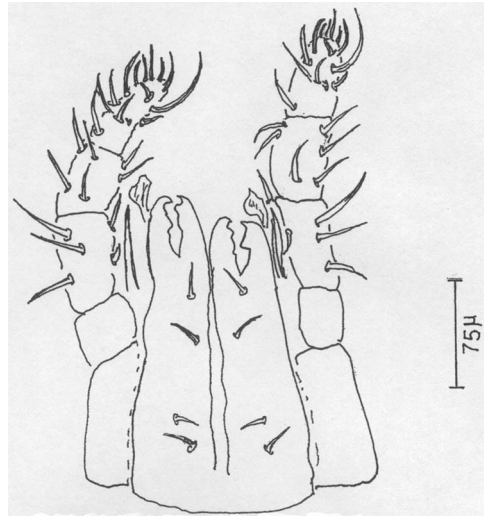

Fig. 5. Gnathosoma of *Gamasellus onitiae* sp. nov.

Table 2. Comparision of *Gamasellus onitiae* sp. nov. with related species.

Characters	*Gamasellus onitiae*	*Gamasellus falciger*	*Gamasellus deepdelensis*	*Gamasellus racovitzai*	*Gamasellus bellavistae*
Dorsum–distal setae	Simple	Serrate	Serrate	Simple	Serrate
Dorsum–ventral setae	Simple	Scapular	Scapular	Simple	Simple
Number of dorsal setae (pairs)	27	42	45	17	44–46
Sternal shield length (μm)	375	125	—	—	—
Peritreme	Anterior portion of coxa IV	Anteriorly extended beyond coxa I	Backward slightly beyond coxa IV	Backward slightly beyond coxa IV	Backward slightly beyond coxa IV

the sternal and genital shields; two and one pairs of setae arise on the anterior and lateral sides of the sternal shield, respectively. Nine pairs of setae are located at the lateral side of the genital shield. The peritreme lies at the anterior portion of coxa IV.

Legs. A pretarsus and a claw were observed at the terminus of each of the legs. Legs I to IV measure 700, 595, 670, and 745 long, respectively. All legs possessed well-developed claws and pulvilli, and the setal pattern was simple.

Leg chaetotaxy. Coxae, 0-0-0-0; trochanter, 10-6-6-7; femora, 7-10-9-6; genua, 8-9-3-2; tibia, 7-3-0-2; and tarsi 19-8-7-7.

Gnathosoma. Gnathosoma 340 long and 200 wide (Table 1). The chelicerae are chelate and dentate. The tritosternum bifid. Two pairs of setae are on the chelicerae (25).

Types. A holotype male marked on the slide, INDIA: Tamil Nadu, Ramanatham, Cuddalore, 03.X.2005. Egg: *Onitis philemon* (Scarabaeidae: Coleoptera), Coll: R. Vaithiyanathan, (No: 117/1). Three paratype slides, collection data same as type.

Diagnosis. This new species resembles *Gamasellus claudiae* Walter; however, the two species were found to differ in the following characters:

- Sternal shields differ in length and width.
- Sternal shield setae were same in both species.
- The new species contains two paranal setae and an adanal seta on the genital shield, in contrast to *G. claudiae*, which possesses six pairs of setae, excluding paranal and adanal setae.

The other differential characters are tabulated in Table 2.

Relationship to the host. Orange-colored mites found attached to the ventrum of head region of the beetle. Mites attach to the beetle body by means of tarsal claws.

Etymology. The mite species is named after the type host genus.

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