

A new species of the genus *Spatulaphorus* RACK (Acari: Heterostigmata, Pygmephoridae) associated with scarab beetles in South Africa

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ABSTRACT: A new species of phoretic mite of the genus *Spatulaphorus* RACK (Acari: Heterostigmata: Pygmephoridae) is described. It was found on a scarab beetle collected on a farm in the vicinity of Johannesburg, South Africa.

KEYWORDS: Acari (Heterostigmata), Pygmephoridae, phoretic *Spatulaphorus*, new species, South Africa.

Introduction

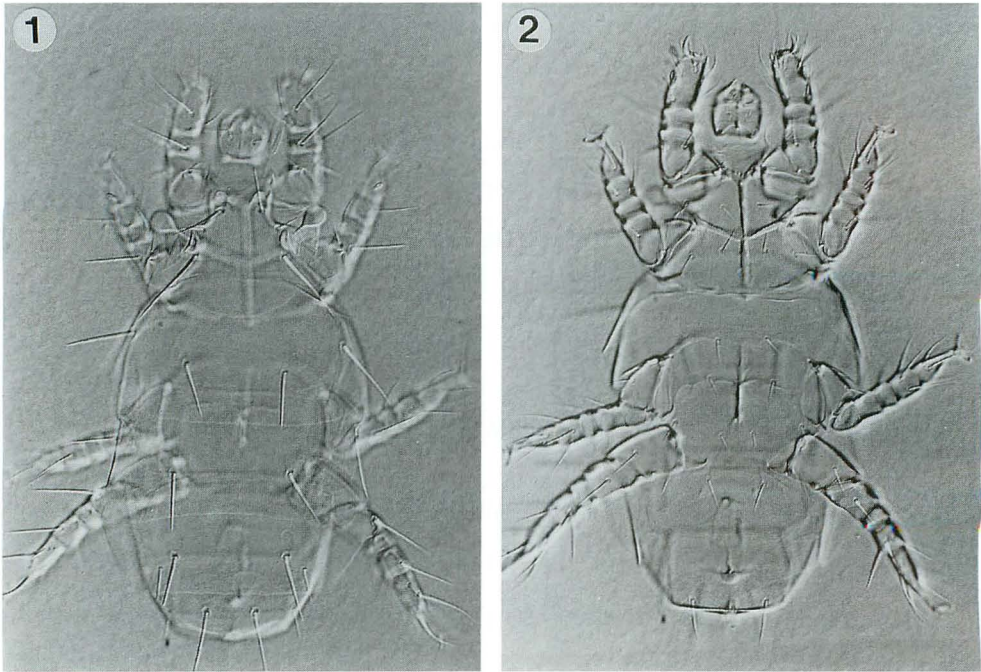
The genus *Spatulaphorus* RACK, 1993 (Acari, Pygmephoridae) includes small mites associated with scarab beetles. Two of the three known species have been described from Botswana, while one has been reported from Vietnam (DASTYCH & RACK 1993a).

During recent study on the systematics and host preferences of pygmephorid mites of the genus *Pediculaster* VITZTHUM, 1931 in South Africa, various insects were collected from cow and horse dung and examined for the presence of mites (CAMERIK & UECKERMANN 1995, CAMERIK 1996). Different flies infested with mites dominated the material, but some scarab beetles were also found. One such beetle hosted numerous pygmephorids, belonging to the genus *Spatulaphorus*. A closer examination of the mites revealed that they represented an unknown species. Its description follows below.

Materials and Methods

The mites taken from the scarab beetle were cleared in lactophenol, preserved in vials with OUDEMANS fluid and mounted on microslides in gum chloral (BERLESE'S medium). Unfortunately the beetle itself has been lost while sent for identification. Setal notation and terminology of structures, follow DASTYCH & RACK (1993a, b), while these, with some small modifications, are based mainly on LINDQUIST (1986). All measurements are in micrometers (μm). The measurement ahead of the parentheses refers to the holotype, in parentheses its min-max range is given. The latter is followed by the arithmetic mean (\bar{x}) and is valid for $n = 25$. The remaining measurements in the text denote holotype, unless otherwise indicated. Photomicrographs were made using photo-microscope "Axiomat" and its interference contrast. Abbreviations used in illustrations are explained in text.

Type material is deposited in the Zoological Museum Hamburg (ZMH), in the Plant Protection Research Institute, Pretoria (PPRI), in the National Museum of Natural History, Budapest (NMNH), in the Canadian National Collection, Ottawa (CNC) and in the collection of A. M. CAMERIK.



Figs 1-2 *Spatulaphorus luriei* sp. n.: 1, 2 - dorsal and ventral view, respectively (interference contrast, holotype).

Systematics

Spatulaphorus luriei sp. n. (Figs 1-8)

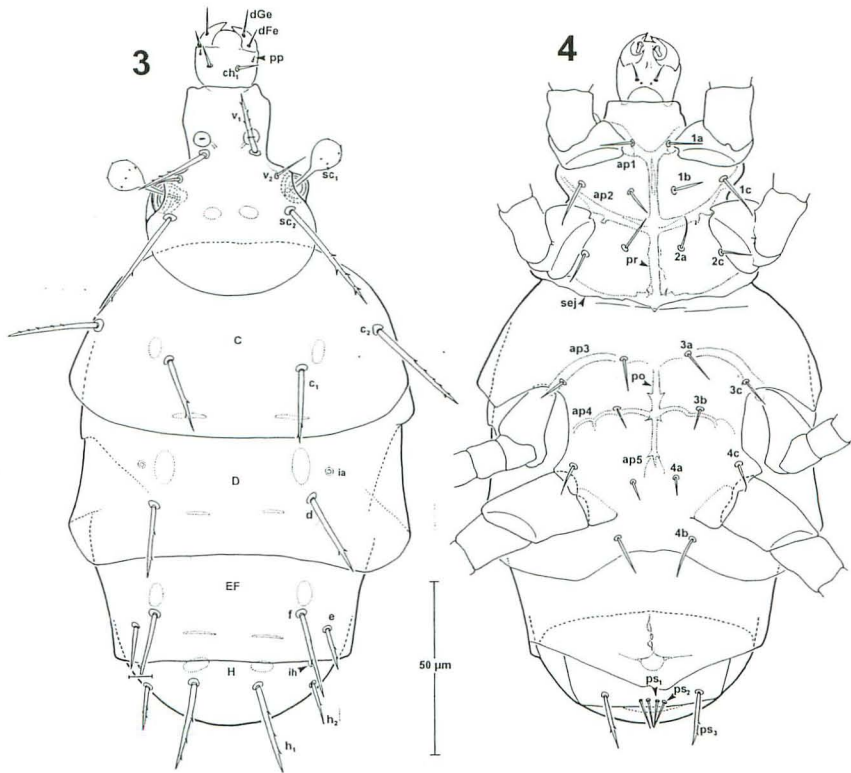
Holotype: Phoretic female, 163 μm long. 26. Oct. 1991. ZMH, Reg. No. A12/97; A. M. CAMERIK leg.

Type locality: Republic of South Africa, Johannesburg, Sandton, Innesfree Farm (26° 06' 24" S + 28° 04' 24" E). Attached to the ventral thoracic bristles of a scarab beetle collected from cow dung.

Paratypes: 56 phoretic females, locality data as for holotype; 23 paratypes deposited in the ZMH (Reg. No. A13/97), 10 in the PPRI, 2 in the NMNH, 2 in the CNC, 11 paratypes in the collection of A. M. CAMERIK.

Etymology: The name of the taxon refers to Mr. A. LURIE, the owner of Innesfree Farm, where the scarab beetle attached to the new species of *Spatulaphorus* had been found.

Diagnosis: Small to median sized species with moderately long dorsal idiosomal and relatively short ventral setae. Hysterosomal setae h_2 about $1/2$ of the length of setae h_1 . Distance between setae e and f moderate. Ventral setae $2c$ about 60-85% of the length of setae $2a$. Caudal setae ps_3 located ventrally on the posterior edge of idiosoma, distinctly longer than the setae ps_1 and ps_2 . Tibiotarsal claw on leg I and its counterpart (= subunguinal seta s) well formed. All tarsal setae on legs II and III more or less setose, i.e. none shaped as a short thick spine. Some tarsal setae on legs I and II (*TiTa u'*, *Tall pv''*) blunt-tipped, their distal tips more or less transparent in transmitted light.

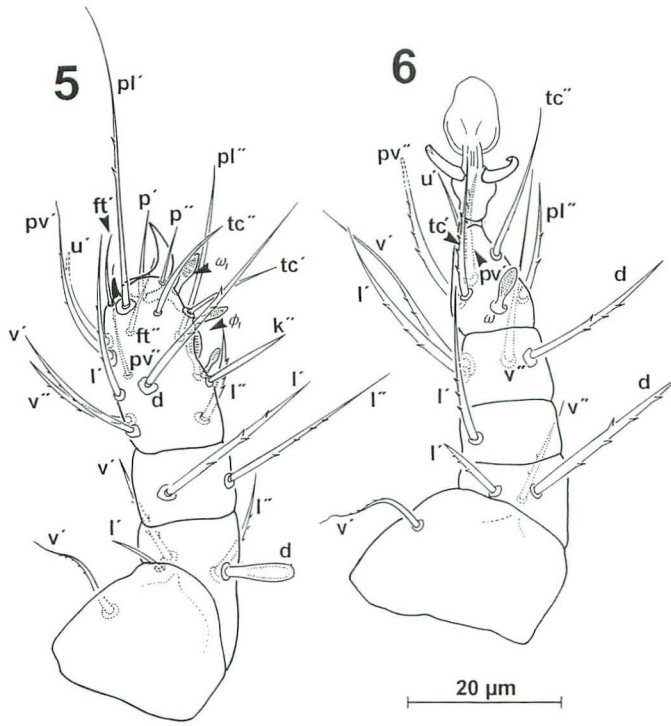


Figs 3-4 *Spatulaphorus luriei* sp. n.: **3** - idiosomal dorsum; **4** - idiosomal venter (holotype).

Description: Adult phoretic female. - Body length 163(156-194; \bar{x} = 177.6). Idiosoma finely punctated, the punctation in some areas often barely visible.

Gnathosoma (Figs 1-4). Gnathosomal capsule more or less quadrangular, with a small dorsomedial apodeme. One pair of smooth cheliceral setae ch_1 present (6 μ m long). A pair of blunt-tipped, short (2.5 μ m) and smooth supracoxal setae (pp) is located anterolaterad of the setae ch_1 . Gnathosomal venter with a pair of short (4 μ m) subcapitular setae su . Palpi short and terminated with small claw-like structure. Genual setae dGe (8 μ m) distinctly longer than the femoral setae dFe (3 μ m). Venter of palpal femurogenou with a short (3 μ m) club-like setigenous accessory structure (sas), solenidion not visible, probably absent. The minute palpal tibiotarsal capsule (pts : 1.5 μ m long) has a tiny rod and is located at the base of tibiotarsal claw.

Idiosomal dorsum (Figs 1, 3). Prodorsal shield with roundish peritremes (5.5 μ m in diameter) provided with a tiny slit. Peritremal tracheae and pharyngeal pumps formed as in *Spatulaphorus camerikae* DASTYCH & RACK, 1993 (see DASTYCH & RACK 1993a: Fig 4 and 9). All dorsal setae more or less slightly barbed, capitulum of sensilla (sc_1) with several tiny teeth. Length formula for the prodorsal setae: $sc_2 > v_1 \geq sc_1 > v_2$. Cupules ia and ih poorly formed, im not visible. Seta f located anteromediad of setae e , distance between the setae moderate. Setae h are located on same transverse level. Distances between all setae h large, between h_1-h_1 and h_1-h_2 almost the same. Segmental apodemes for muscle insertion distinct.



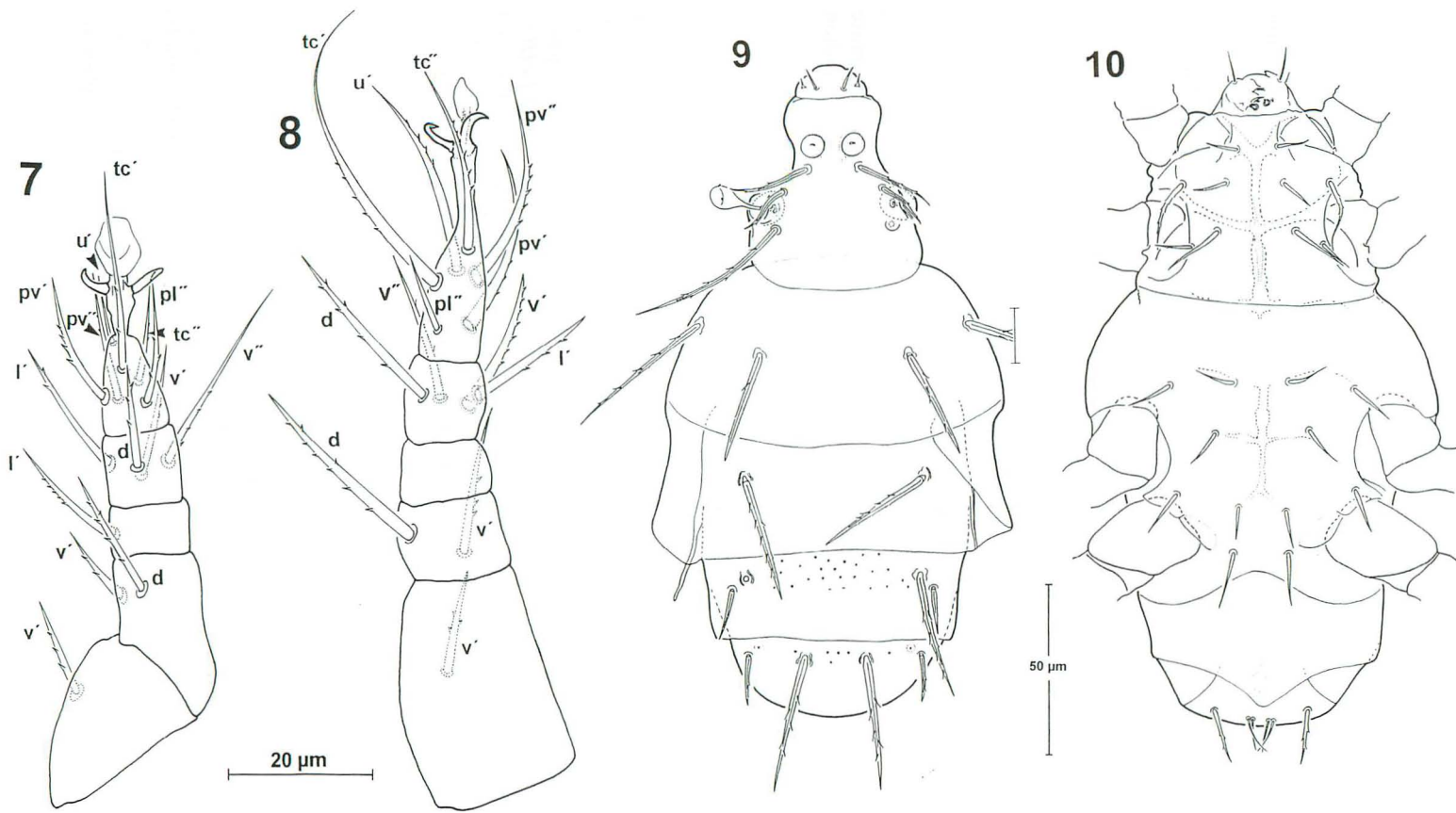
Figs 5-6 *Spatulaphorus luriei* sp. n.: **5**- leg I [counterpart (= seta *s*) is located at the claw base and marked in black]; **6**- leg II (both dorsal view, paratype).

Lengths of dorsal idiosomal setae as follow: $v_1 = 18(15-20; \bar{x} = 18.4)$, $v_2 = 8(7-10; \bar{x} = 8.7)$, $sc_1 = 18(17-19; \bar{x} = 18.1)$, $sc_2 = 29(27-32; \bar{x} = 29.7)$, $c_1 = 19(17-22; \bar{x} = 19.6)$, $c_2 = 25(23-31; \bar{x} = 27.4)$, $d = 20(18-23; \bar{x} = 21.2)$, $e = 11(10-15; \bar{x} = 11.5)$, $f = 23(19-28; \bar{x} = 23.4)$, $h_1 = 23(22-39; \bar{x} = 24.4)$, $h_2 = 10(12-15; \bar{x} = 12.8)$. Distances between the setae: $v_1 = 14(13-16; \bar{x} = 13.8)$, $v_2 = 25(23-28; \bar{x} = 25.9)$, $sc_1 = 28(24-34; \bar{x} = 32.4)$, $sc_2 = 31(28-34; \bar{x} = 31.4)$, $c_1 = 33(29-37; \bar{x} = 34.4)$, $c_2 = 70(63-80; \bar{x} = 74.2)$, $d = 40(34-45; \bar{x} = 40.7)$, $e = 49(43-59; \bar{x} = 51.3)$, $f = 38(34-43; \bar{x} = 40.1)$, $h_1 = 16(13-20; \bar{x} = 16.7)$, $h_2 = 42(38-50; \bar{x} = 44.8)$.

Idiosomal venter (Figs 2, 4). All propodosomal apodemes (*ap1*, *ap2* and *sej*: the sejugal one) well sclerotized, metapodosomal apodemes in part poorly formed (Fig. 4). The third apodeme (*ap3*) weakly sclerotized in its middle, *ap4* partly and moderately undulated. Apodemes *ap5* almost invisible, vestigial. Presternal (*pr*) and poststernal (*po*) apodemes well formed.

Ventral setae more or less needle-like and smooth, except setae *1c* which is sometimes slightly barbed. Setae *1c* and *4b* longest, setae *4a* shortest. Among all ventral setae, the seta *3a* is least variable in length. Caudal setae *ps*₂ usually slightly longer than setae *ps*₁. Distance between both setae *ps*₁ usually slightly greater or the same as that between setae *ps*₁ and *ps*₂. The setae *ps*₁ and *ps*₂ situated on the same transverse level.

Lengths of ventral idiosomal setae as follow: $1a = 10(9-12; \bar{x} = 10.2)$, $1b = 6(6-8; \bar{x} = 6.9)$, $1c = 12(11-14; \bar{x} = 11.9)$, $2a = 9(9-11; \bar{x} = 10.1)$, $2c = 7(5-9; \bar{x} = 8.1)$, $3a = 9(8-9; \bar{x} = 9.1)$, $3b = 7(7-8; \bar{x} = 7.9)$, $3c = 9(8-11; \bar{x} = 9.3)$, $4a = 6(6-8; \bar{x} = 7.9)$, $4b = 10(9-$



Figs 7-10 *Spatulaphorus luriei* sp. n.: **7** – leg III; **8** – leg IV (both dorsal view, paratype); *Spatulaphorus langi* DASTYCH & RACK, 1993: **9-10** – dorsal and ventral view, respectively (after DASTYCH & RACK 1993a, modified).

13; $\bar{x} = 11.2$), $4c = 9(8-11; \bar{x} = 9.5)$, $ps_1 = 7(5-7; \bar{x} = 6.3)$, $ps_2 = 7(7-9; \bar{x} = 7.7)$, $ps_3, \bar{x} 14(12-16; \bar{x} = 14.4)$. Distances between the setae: $1a = 9(9-12; \bar{x} = 10.5)$, $1b = 12(11-13; \bar{x} = 12.8)$, $1c = 37(35-40; \bar{x} = 38.2)$, $2a = 14(13-17; \bar{x} = 15.6)$, $2c = 35(33-40; \bar{x} = 36.9)$, $3a = 17(16-20; \bar{x} = 17.8)$, $3b = 21(21-24; \bar{x} = 22.6)$, $3c = 47(46-53; \bar{x} = 49.6)$, $4a = 11(10-13; \bar{x} = 11.5)$, $4b = 18(14-20; \bar{x} = 16.6)$, $4c = 42(41-49; \bar{x} = 45.3)$, $ps_1-ps_1 = 1.3(0.9-2.7; \bar{x} = 1.9)$, $ps_1-ps_2 = 1.8(0.9-3.1; \bar{x} = 1.8)$, $ps_2-ps_3 = 10(7-10; \bar{x} = 9.2)$.

Legs (Figs 5-8): Similar in shape to those of *S. camerikae*, their length increasing toward the posterior end of the body. Distal segments of legs I distinctly wider than those of legs II to IV. Tibiotarsus (*TiTa*) with well formed claw. Subunguinal seta *s* forms a distinct counterpart inserted at the claw base. Claws on legs II to IV relatively small, of similar size, smooth and simple. Empodia smooth and of moderate size. Empodial stalks short.

Leg I (Fig 5): Setal formula for each joint: *Tr*(1), *Fe*(4), *Ge*(2), *TiTa* (18 + 4 solenidia: $\omega_1, \omega_2, \phi_1, \phi_2$). Tibiotarsus elongated, not wider than the genu. Claw sickle-shaped, counterpart moderately long. Seta *FeI d* spatulate. Seta *u'* blunt-tipped and with endings more transparent than rest of seta, thus hardly visible in a transmitted light. Tarsal and tibial eupathidia smooth. Other setae either only slightly barbed or smooth. Seta *FeI l'* always short and smooth. Solenidia ω_1 and ϕ_1 of same size and shape, thicker and longer (5 μm) than solenidia ω_2 and ϕ_2 (4 and 3.5 μm long, respectively). Internal tibiotarsal thickening poorly developed.

Leg II (Fig. 6): Setal formula *Tr*(1), *Fe*(3), *Ge*(1), *Ti*(4), *Ta*(6 + solenidion ω). All setae, except *u'*, barbed. Primiventral setae *pv''* blunt-tipped, their distal tips more transparent than proximal ones; this character often poorly visible. Tarsal solenidion ω well formed, 5 μm long, tibial solenidion ϕ absent.

Leg III (Fig. 7): Setal formula *Tr*(1), *Fe*(2), *Ge*(1), *Ti*(4), *Ta*(6). All setae, except seta *u'*, more or less barbed. Tarsal and tibial solenidion absent.

Leg IV (Fig. 8): Setal formula *Tr*(1), *Fe*(2), *Ge*(0), *Ti*(4), *Fe*(6). All setae, except *TaIV pl''*, barbed. Tarsal and tibial solenidion absent.

Non-phoretic females, males and immatures unknown.

Comments: The new species differs markedly from *Spatulaphorus foliatus* DASTYCH & RACK, 1993 by its larger tibiotarsal claw and the presence of a counterpart; this claw being distinctly smaller while the counterpart absent in *S. foliatus*. Furthermore, the leg setae *TaII tc'* and *TaIII pv'* are setose in *S. luriei* sp. n., but are short and thick spines in *S. foliatus*. In the latter taxon some other leg setae, i.e. *FeII v'*, *TrIII v'* and *FeIII v'* are also distinctly thicker than those in the new species. Additionally, opisthosomal setae h_2 and *e* are relatively longer in *S. luriei* sp. n., compared to those in *S. foliatus*.

S. luriei sp. n. is more similar and supposedly also more closely related to *S. camerikae* and *S. langi* DASTYCH & RACK, 1993 than to *S. foliatus*. The new species resembles most closely *S. camerikae*, but can readily be separated from latter by its distinctly shorter caudal setae ps_1 and ps_2 . Furthermore, in *S. luriei* sp. n. the distance between setae *e* and *f* is shorter, apodeme *ap4* undulate and apodeme *ap5* is distinctly reduced (vestigial) and not shaped as inverted "Y", as in *S. camerikae*.

The new species can be easily distinguished from *S. langi* (Figs. 9, 10) by the presence of setose tarsal setae *TaII tc'* and *TaIII pv'* and longer setae *e* and h_2 . These tarsal setae are formed as thick, short spines in *S. langi*. Furthermore, the distal ends of primiventral setae *pv* on legs I and II are much more expanded (foliate) in *S. langi*, compared to less transformed (expanded) such setae in the new species. Additionally, *S. luriei* sp. n. differs from *S. langi* by its shorter dorsal and ventral idiosomal setae, longer distance between setae *e* and *f* and shorter distance between caudal setae ps_1-ps_1 .

All scanty data on four species of the genus *Spatulaphorus* suggest phoretic preference of these mites, limited probably to scarab beetles.

Identification key for species of the genus *Spatulaphorus*

1. Tibiotarsus I with large, hook-like claw and a distinct counterpart opposite to the claw base 2
 - Tibiotarsus I with a small, almost straight claw, and no counterpart *S. foliatus*
2. Opisthosomal setae h_2 about $\frac{1}{2}$ of length of setae h_1 (Fig. 3). Tarsal setae *TaII tc'* and *TaIII pv'* moderately long and setiform 3
 - Setae h_2 about $\frac{1}{3}$ of length of setae h_1 (Fig. 10). Tarsal setae *TaII tc'* and *TaIII pv'* short, thick and spine-like *S. langi*
3. Setae ps_1 and ps_2 longer than ps_3 , setae *2a* and *2c* of almost equal length *S. camerikae*
 - Setae ps_1 and ps_2 distinctly (about 50%) shorter than ps_3 . Setae *2a* longer than setae *2c* (the latter 60-85% of the length of *2a*) *S. luriei* sp. n.

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Zusammenfassung

Es wird eine neue Milbenart aus der Gattung *Spatulaphorus* (Acari: Heterostigmata, Pygmephoridae) beschrieben. Sie ist auf einem Mistkäfer (Scarabaeidae) in der Umgebung von Johannesburg (Südafrika) gefunden worden.

References

- CAMERIK, A. M. & UECKERMANN, E. A., 1995: *Pediculaster norrbomialis* sp. n. and *P. gracilis* sp. n. (Acari, Heterostigmata: Pygmephoridae) from South Africa, with notes on host and dung preference of their phoretic females. - Mitt. hamb. zool. Mus. Inst., 92: 73-86.
- CAMERIK, A. M., 1996: Phoretic females of *Pediculaster gautengensis* sp. n. (Acari: Pygmephoridae) associated with insects collected from dung in South Africa. - Mitt. hamb. zool. Mus. Inst., 93: 161-170.
- DASTYCH, H. & RACK, G., 1993a: *Spatulaphorus* RACK gen. n. and three new species of pygmephorid mites associated with scarab beetles in Botswana and Vietnam (Acari: Heterostigmata). - Mitt. hamb. zool. Mus. Inst., 90: 265-284.
- , 1993b: Some notes on morphology of mites of the genus *Pygmephorus* (Acari: Heterostigmata). - Acarologia, 34: 131-141.
- LINDQUIST, E. E., 1986: The world genera of Tarsonemidae (Acari: Heterostigmata): a morphological, phylogenetic and systematic revision, with a reclassification of family-group taxa in the Heterostigmata. - Mem. Ent. Soc. Can., 136: 1-517.

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