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## Article

# Two new species of *Pavania* (Acari: Heterostigmata: Dolichocybidae) associated with scarab beetles (Coleoptera: Scarabaeidae) from Tanzania and Madagascar

Alexander A. Khaustov<sup>1\*</sup>  and Andrey V. Frolov<sup>2</sup> 

1. Tyumen State University, Tyumen, 6 Volodarskogo Str., 625003 Russia; E-mail: [alex1973khaustov@gmail.com](mailto:alex1973khaustov@gmail.com)

2. Zoological Institute of Russian Academy of Sciences, Universitetskaya Embankment 1, 199034, Saint Petersburg, Russia; E-mail: [afrolov@zin.ru](mailto:afrolov@zin.ru)

\* Corresponding author

## ABSTRACT

Two new species of *Pavania* (Acari: Heterostigmata: Dolichocybidae) phoretic on dung beetles (Coleoptera: Scarabaeidae), *P. neoaficana* sp. nov. has been collected on *Helicopris neptunus* in Tanzania, and *P. madagascariensis* sp. nov. has been collected on *Helictipleurus quadripunctatus* in Madagascar are described. The updated key to species of the genus *Pavania* is provided. The family Dolichocybidae is reported from Madagascar for the first time.

**KEY WORDS:** Afrotropical region; dung beetle; key; phoresy; systematics.

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## INTRODUCTION

The family Dolichocybidae is a small group of early-derivative heterostigmatic mites that currently includes two subfamilies, six genera, 57 extant and one fossil species (Hajiqanbar and Khaustov 2010; Rahiminejad *et al.* 2011; Loghmani *et al.* 2013; Katlav *et al.* 2014, 2020; Bahramian *et al.* 2015; Mortazavi *et al.* 2015; Sobhi *et al.* 2017; Khaustov and Frolov 2017, 2018a, b, 2020a, b; Khaustov 2017; Khaustov and Trach 2017, 2018; Hajiqanbar *et al.* 2019; Katlav *et al.* 2020; Khaustov *et al.* 2021). Little is known about the way of life of dolichocybid mites, but all of them are probably fungivorous (Rack 1967; Magowski 1988; Kaliszewski *et al.* 1995); some species are important pests of edible mushrooms (Lan *et al.* 2017). On the other hand, most of them are associated with insects (mostly beetles) and utilize them for phoresy (Khaustov and Trach 2017). The genus *Pavania* Lombardini is the largest in the family and includes 34 species, described from Eurasia, Africa, South America and Australia (Khaustov & Frolov 2020b; Katlav *et al.* 2020).

At present, six species of *Pavania* have been reported from Africa, namely *P. perhirsuta* Mahunka, 1973, *P. simplex* Mahunka, 1973, *P. luisae* Mahunka, 1974, *P. endroedyi* Mahunka, 1975, *P. equisetosa* Mahunka, 1975 (all from Ghana), *P. tahanan* Sevestianov and Abo-Korah, 1985 (Egypt), *P. africana* Khaustov and Frolov, 2018 (South Africa) (Khaustov and Frolov 2020b). Previously no dolichocybid mites were recorded from Madagascar.

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During the study of mites associated with scarab beetles, two new species of *Pavania* were recovered from Africa and Madagascar as phoretic on scarab beetles *Heliocopris neptunus* Boheman and *Helictipleurus quadripunctatus* (Olivier), respectively. The aim of this paper is describing these new species. Moreover, the updated key to species of the genus *Pavania* is provided.

## MATERIAL AND METHODS

The host beetle, *H. neptunus*, was collected in northern Tanzania most probably in elephant dung and the other one host beetle species, *H. quadripunctatus*, was collected in central Madagascar in cow dung. The *Helictipleurus* beetle was kept in 96% ethanol until dissecting. The mites were found attached to the membrane connecting prothorax and mesothorax. Collected mites were kept in 96% ethanol and later cleared in lactic acid and mounted in Hoyer's medium. Mite morphology was studied using an AxioImager A2 (Carl Zeiss, Germany) compound microscope with phase contrast and DIC illumination. Photomicrographs were taken with an AxioCam ICc5 (Carl Zeiss, Germany) digital camera.

The terminology of the idiosoma and legs follows Lindquist (1986); the nomenclature of subcapitular setae and the designation of cheliceral setae follow Grandjean (1944, 1947), respectively. All measurements are given in micrometers ( $\mu\text{m}$ ) for the holotype and five paratypes (in parentheses). For leg chaetotaxy, the number of solenidia is given in parentheses.

## RESULTS

### Family Dolichocybidae Mahunka, 1970

#### Genus *Pavania* Lombardini, 1949

**Type species:** *Pavania fusiformis* Lombardini, 1949, by original designation.

#### *Pavania neoafricana* sp. nov. (Figs. 1–3)

<http://zoobank.org/urn:lsid:zoobank.org:act:5E86BBCC-CDC4-4314-9217-5E964E0B89FB>

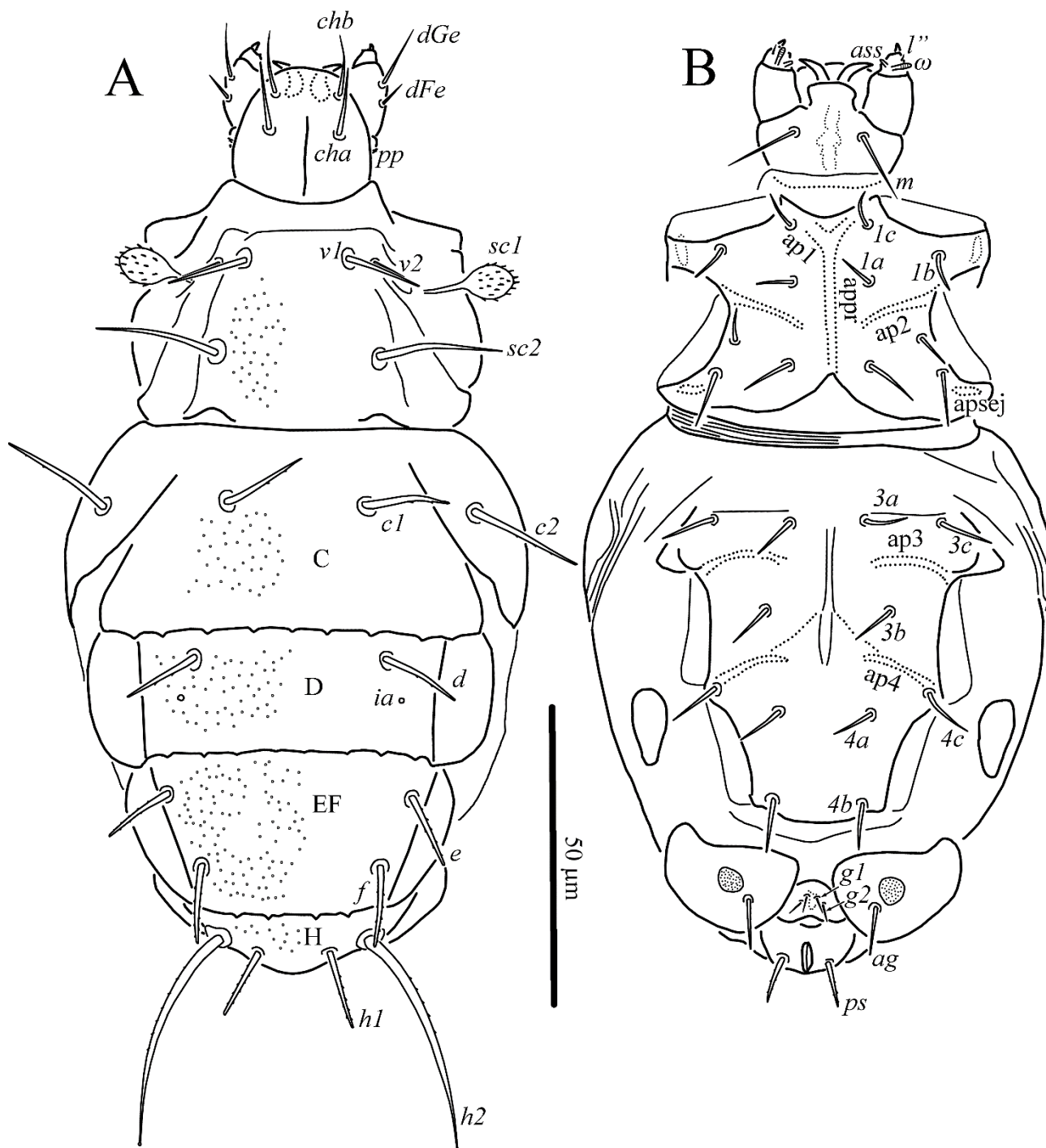
#### Description

**Female (Figs. 1–3)** – Body weakly sclerotized. Length of idiosoma 125 (120–125), width 77 (72–78).

**Gnathosoma** – Gnathosomal capsule, excluding palps, almost round, its length 25 (23–25), width 24 (23–25). Dorsally with two pairs of smooth subequal cheliceral setae (*cha*, *chb*). Setae *cha* 12 (11–12) blunt-tipped; *chb* 11 (10–11) pointed. Dorsal median apodeme weakly developed. Postpalpal setae (*pp*) rod-like with tiny distal projections, situated posterolaterally to setae *cha*. Venter of gnathosoma with one pair of smooth, pointed subcapitular setae *m* 13 (11–13). Palps freely articulated to gnathosomal capsule, with smooth setae *dFe* and *dGe* dorsally, setae *dGe* 11 (10–11) pointed, about two times longer than weakly blunt-tipped *dFe* 4 (4–5). Palps ventrally with solenidion almost three times longer than accessory setigenous structure (*ass*). Palps terminated with a well-developed tibial claw. Palp tibiotarsus with tiny eupathid-like distal seta and small lateral seta *l''*. Cheliceral stylets strong, curved. Pharynx poorly visible, with weak lateral projections.

**Idiosomal dorsum (Figs. 1A, 3A)** – All dorsal sclerites with clearly visible numerous round and very small puncta. Prodorsal shield with three pairs of setae (*v1*, *v2*, *sc2*) and one pair of clavate, barbed trichobothria *sc1* with rounded apex. All dorsal setae blunt-tipped; tips of setae *h2* club-shaped. Setae *v1*, *v2*, and *sc2* smooth, other dorsal setae weakly barbed. Only cupules *ia* on tergite D clearly visible; other cupules not evident. Posterior margins of tergites C, D, and EF with several distinct tooth-like projections. Lengths of dorsal setae: *v1* 13 (13–14), *v2* 7 (6–7), *sc2* 20 (20–22), *c1* 15 (14–15), *c2* 20 (19–21), *d* 13 (12–14), *e* 13 (12–13), *f* 13 (13–14), *h1* 13 (12–14), *h2* 37 (37–38).

Distances between setae:  $v1-v1$  17 (17),  $v2-v2$  26 (25–26),  $sc2-sc2$  27 (27),  $c1-c1$  23 (22–23),  $c1-c2$  18 (18–19),  $d-d$  32 (28–32),  $e-e$  41 (39–41),  $f-f$  29 (28–29),  $h1-h1$  12 (11–12),  $h1-h2$  7 (7).

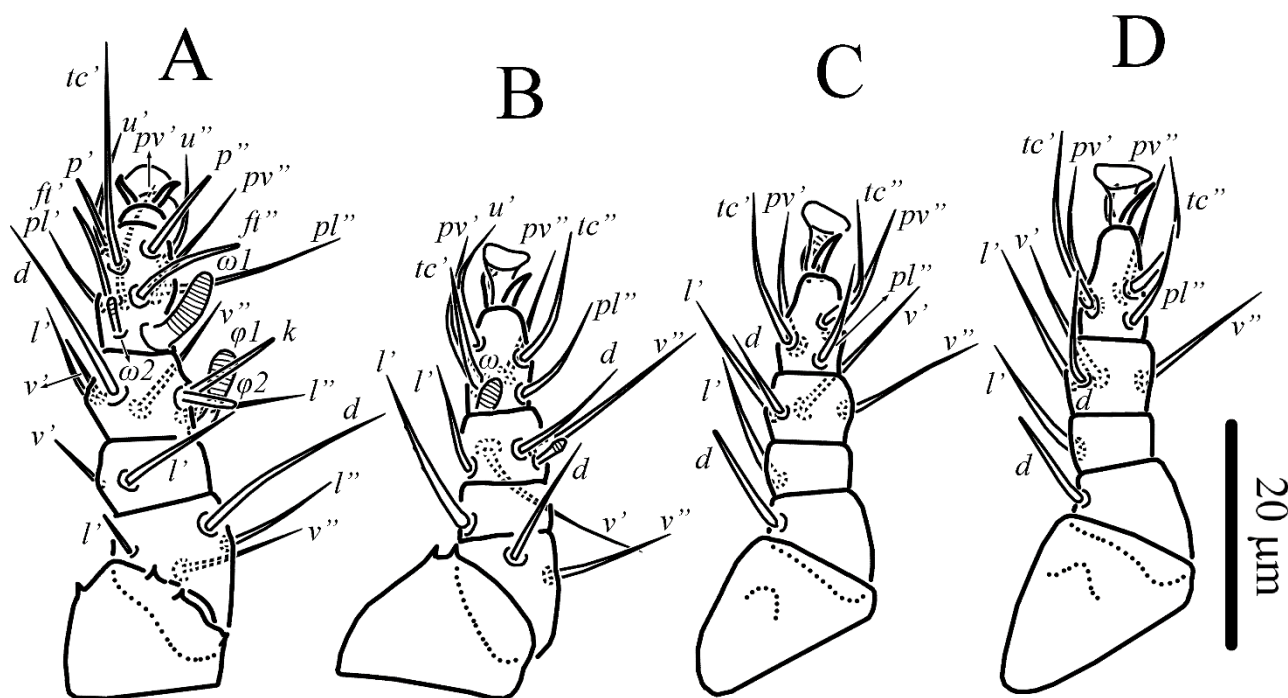


**Figure 1.** *Pavania neoafricana* sp. nov. (female) – **A.** Dorsum of body; **B.** Venter of body. Legs omitted.

**Idiosomal venter (Figs 1B, 3B)** – All ventral plates smooth. All ventral setae weakly blunt-tipped; setae *ps* weakly barbed, other ventral setae smooth. Apodemes 1 (*ap1*) and apodemes 2 (*ap2*) well developed; *ap1* joined with poorly visible prosternal apodeme (*appr*), sejugal apodeme represented by pair of small sclerites located posterolaterad setae *2c*; apodemes 3 (*ap3*) and 4 (*ap4*) well developed. Poststernal apodeme absent. Coxal fields I–IV each with three pairs of setae.

**Lengths of ventral setae** – *1a* 6 (6), *1b* 6 (6), *1c* 6 (6), *2a* 10 (8–10), *2b* 6 (5–6), *2c* 9 (8–9), *3a* 8 (7–8), *3b* 8 (7–8), *3c* 10 (9–11), *4a* 8 (7–8), *4b* 9 (9–10), *4c* 9 (9), *ag* 8 (8–9), *g1* 3 (3), *g2* 3 (3), *ps* 8 (8–9).

**Legs (Fig. 2)** – Leg I slightly longer than subequal legs II–IV. Leg I (Fig. 2A). Setal formula: 0–4–2–6(2)–11(2). Tarsus with two small claws and semioval empodium. All leg setae smooth. Setae *l'* of femur, *l'* and *v'* of genu, *k* and *v'* of tibia blunt-tipped; other leg setae (except eupathidia *p'*, *p''*, *ft'*, *ft''*) pointed; setae (*u*) and (*pv*) of tarsus not modified. Trochanter dorsally with four short tooth-like projections. Tarsus I with ventrodiscal membranous flange. Lengths of solenidia  $\omega 1$  7 (6–7),  $\omega 2$  3 (3),  $\phi 1$  8 (8),  $\phi 2$  5 (4–5); solenidion  $\omega 1$  digitiform; solenidia  $\phi 2$  and  $\omega 2$  baculiform; solenidion  $\phi 1$  clavate. Leg II (Fig. 2B). Setal formula: 0–2–1–4(1)–6(1). Tarsal claws simple, hooked; empodium large, extending beyond tips of claws. Solenidion  $\omega$  5 (4–5) digitiform; solenidion  $\phi$  3 (3) weakly clavate. Trochanter dorsolaterally with two tooth-like projections. Seta *l'* of genu weakly barbed, other setae smooth; all setae pointed. Leg III (Fig. 2C). Setal formula: 0–1–1–4–5. Claws and empodium of same shape as on tarsus II. Setae *d* of femur blunt-tipped, other leg setae pointed; all setae smooth. Trochanter ventrally with short lobe. Leg IV (Fig. 2D). Setal formula: 0–1–1–4–5. Claws and empodium of same shape as on tarsus II. Setae *d* of femur blunt-tipped, other leg setae pointed; all setae smooth. Trochanter ventrally with short lobe.



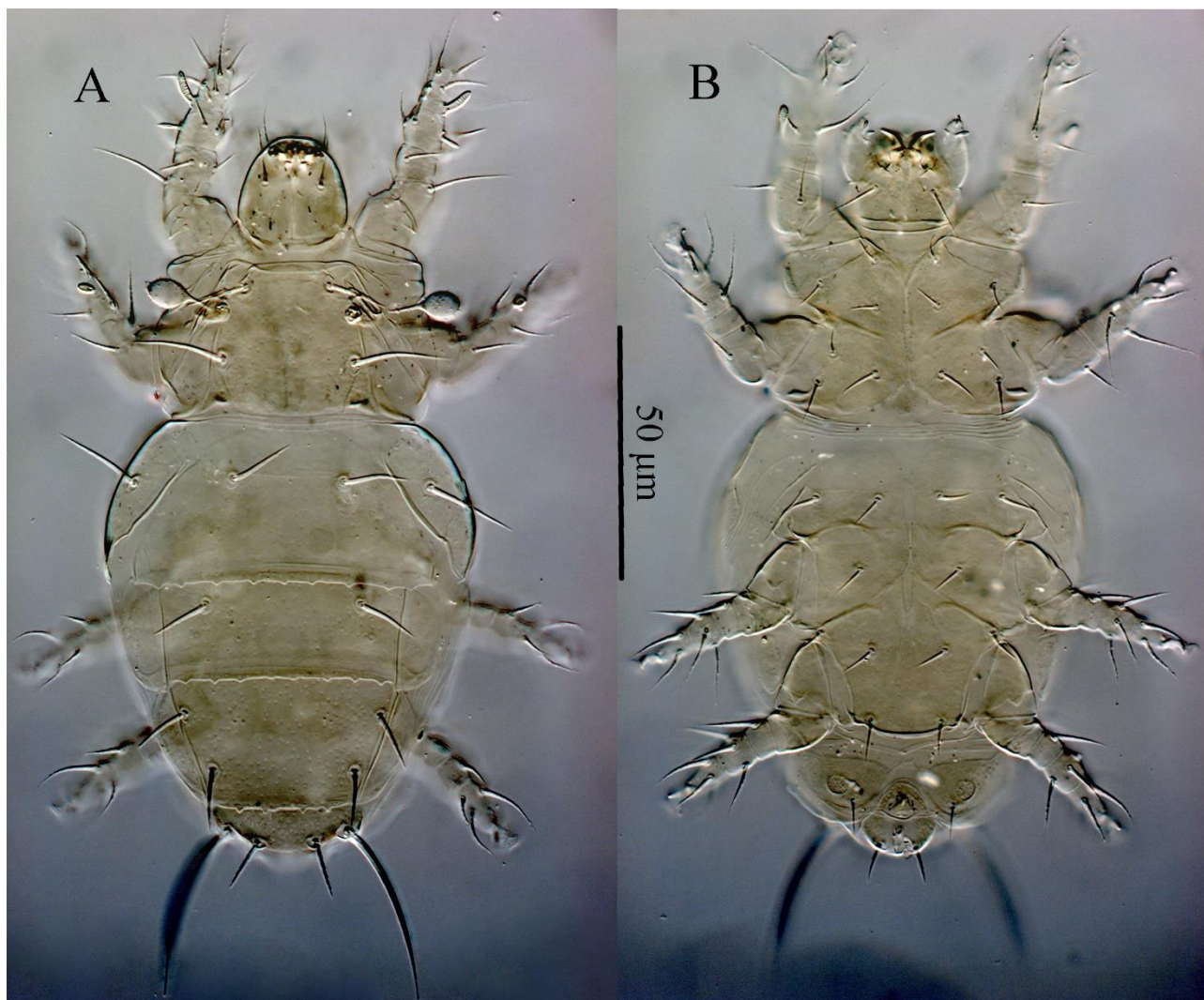
**Figure 2.** *Pavana neoaficana* sp. nov. (female) – A–D. Right legs I–IV, respectively.

**Male** – unknown

#### Type material

Female holotype, slide No. ZISP T-Dol-003, Tanzania, Arusha, 1975 (the original label includes only a code [1777]; the Arusha locality was inferred from the labels of the beetles collected apparently in the same locality), on *H. neptunus*; paratypes: 50 females, same data.





**Figure 3.** DIC micrographs of *Pavana neoaficana* sp. nov. (female) – **A.** Dorsal view; **B.** Ventral view.

#### *Type deposition*

The holotype and 10 paratypes are deposited in the collection of the Zoological Institute of RAS, Saint Petersburg, Russia; five female paratypes are deposited in the acarological collection of Jalal Afshar Zoological Museum, Department of Plant Protection, Faculty of Agriculture, University of Tehran, Karaj, Iran (JAZM); other paratypes are deposited in the collection of the Tyumen State University Museum of Zoology, Tyumen, Russia.

#### *Differential diagnosis*

The new species is most similar to *Pavana africana* Khaustov and Frolov, 2018 and *P. carabidophila* Khaustov, 2005 by the similar length of idiosomal setae and absence of modified setae on legs. The new species differs from *P. africana* in having seta *c2* blunt-tipped (pointed in *P. africana*), longer genital setae (3) (1–2 in *P. africana*), shorter setae *ps* (8–9) (14 in *P. africana*), in having four tooth-like projections on trochanter I (three projections in *P. africana*), and solenidion  $\phi 2$  with rounded tip ( $\phi 2$  with attenuate tip in *P. africana*). The new species differs from *P. carabidophila* in having setae *c2* blunt-tipped (pointed in *P. carabidophila*), setae *h2* with club-shaped tips (pointed in *P. carabidophila*), by much shorter solenidion  $\omega 1$  (6–7) (11–12 in *P.*

*carabidophila*), and in having setae *cha* and *chb* subequal (*cha* distinctly longer than *chb* in *P. carabidophila*).

### Etymology

The name of the new species is a combination of two words: Greek *neos* meaning *new* and *africana*, the name of closely related species.

### *Pavania madagascariensis* sp. nov. (Figs. 4–6)

<http://zoobank.org/urn:lsid:zoobank.org:act:CFDAAEAE-9088-4266-9812-EE93CB9AE306>

### Description

**Female (Figs. 4–6)** – Body weakly sclerotized. Length of idiosoma 120 (115–120), width 78 (75–80).

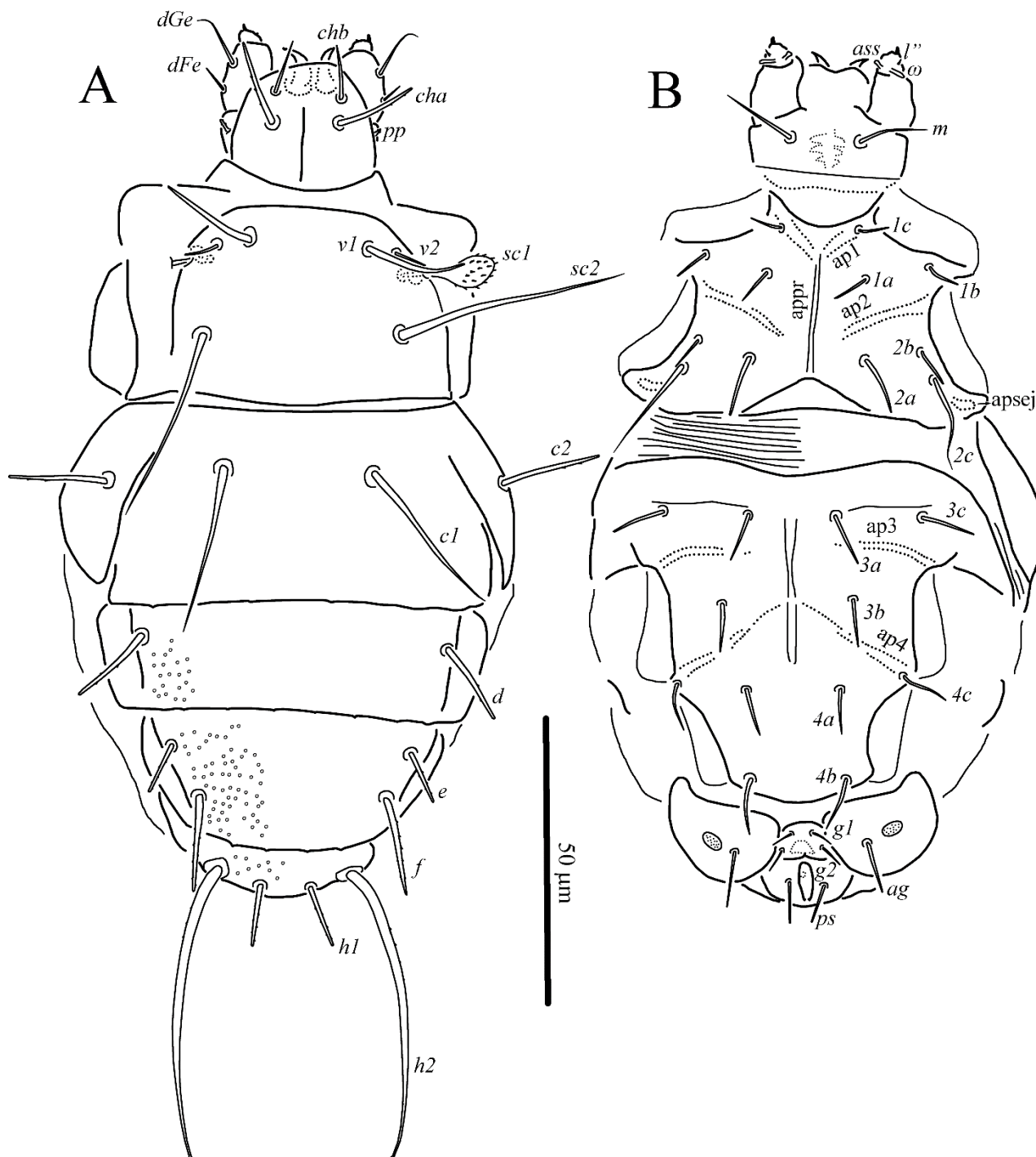
**Gnathosoma** – Gnathosomal capsule, excluding palps, almost round, its length 24 (23–24), width 27 (27–28). Dorsally with two pairs of blunt-tipped cheliceral setae (*cha*, *chb*). Setae *cha* 15 (15–16) weakly barbed; *chb* 10 (10–11) smooth. Dorsal median apodeme weakly developed. Postpalpal setae (*pp*) rod-like with tiny distal projections, situated posterolaterally to setae *cha*. Venter of gnathosoma with one pair of smooth, pointed subcapitular setae *m* 12 (12–13). Palps with smooth setae *dFe* and *dGe* dorsally, setae *dGe* 11 (10–11) pointed, about two times longer than weakly blunt-tipped *dFe* 4 (4–5). Palps ventrally with solenidion almost two times longer than accessory setigenous structure. Palps terminated with well-developed tibial claw. Palp tibiotarsus with tiny eupathid-like distal seta and small lateral seta *l'*. Cheliceral stylets strong, curved. Pharynx poorly visible, with weak lateral projections.

**Idiosomal dorsum (Figs. 4A, 6A)** – Tergites D, EF and H with round and very small puncta, similar puncta also poorly visible on prodorsal shield; tergite C smooth. Prodorsal shield with three pairs of setae (*v1*, *v2*, *sc2*) and one pair of clavate, barbed trichobothria *sc1* with rounded apex. Setae *sc2* and *c1* pointed, other dorsal setae blunt-tipped; tips of setae *h2* club-shaped. Setae *v1*, *v2*, *sc2* and *c1* smooth, other dorsal setae weakly barbed. Cupules on tergites not evident. Posterior margins of tergites C, D, and EF with several very small tooth-like projections. Lengths of dorsal setae: *v1* 17 (17–18), *v2* 6 (6), *sc2* 41 (39–43), *c1* 30 (29–31), *c2* 18 (18–19), *d* 14 (15–16), *e* 9 (9–10), *f* 16 (17–19), *h1* 11 (10–11), *h2* 52 (52–54). Distances between setae: *v1*–*v1* 20 (21–23), *v2*–*v2* 31 (29–32), *sc2*–*sc2* 34 (33–35), *c1*–*c1* 26 (26–28), *c1*–*c2* 20 (19–22), *d*–*d* 53 (50–53), *e*–*e* 42 (39–43), *f*–*f* 32 (31–34), *h1*–*h1* 9 (8–10), *h1*–*h2* 8 (8).

**Idiosomal venter (Figs. 4B, 6B)** – All ventral plates smooth. Setae *2c* pointed, other ventral setae weakly blunt-tipped; all ventral setae smooth. Apodemes 1 (*ap1*) and apodemes 2 (*ap2*) well developed; *ap1* joined with poorly visible prosternal apodeme (*appr*), sejugal apodeme represented by pair of small sclerites located posterolaterad setae *2c*; apodemes 3 (*ap3*) and 4 (*ap4*) well developed. Poststernal apodeme absent. Coxal fields I–IV each with three pairs of setae. Lengths of ventral setae: *1a* 7 (6–7), *1b* 7 (6–7), *1c* 6 (6–7), *2a* 11 (10–11), *2b* 7 (7), *2c* 20 (18–20), *3a* 10 (8–10), *3b* 9 (8–10), *3c* 10 (9–10), *4a* 9 (9), *4b* 9 (9–10), *4c* 9 (8–9), *ag* 9 (8–9), *g1* 5 (5), *g2* 5 (5), *ps* 7 (7–8).

**Legs (Fig. 5)** – All legs subequal in length. Setation of legs I–IV as in *P. neoaficana* sp. nov. Leg I (Fig. 5A). Tarsus with two small claws and semi-oval empodium. At least seta *d* of femur weakly barbed, other setae smooth. Setae *l'* of femur, *l'* and *v'* of genu, *k*, *v'* of tibia, and (*u*) of tarsus blunt-tipped; other leg setae (except eupathidia *p'*, *p''*, *ft'*, *ft''*) pointed; setae (*u*) and (*pv*) of tarsus not modified. Trochanter dorsally with one short tooth-like projection. Tarsus I with large ventrodistal membranous flange. Lengths of solenidia  $\omega 1$  6 (6),  $\omega 2$  3 (3),  $\phi 1$  7 (7),  $\phi 2$  4 (4–5); solenidion  $\omega 1$  digitiform; solenidia  $\phi 2$  and  $\omega 2$  baculiform; solenidion  $\phi 1$  clavate. Leg II (Fig. 5B). Tarsal claws simple, hooked; empodium large, extending beyond tips of claws. Solenidion  $\omega$  5 (4–5) digitiform; solenidion  $\phi$  3 (1–3) weakly clavate. Trochanter dorsolaterally with two tooth-like projections. All

leg setae smooth; seta *l'* of tibia incrassate, spiniform and slightly curved; setae *tc''*, *u'* and (*pv*) weakly blunt-tipped; other setae pointed. Leg III (Fig. 5C). Claws and empodium of same shape as on tarsus II. All setae smooth; setae *d* of femur and (*tc*) of tarsus weakly blunt-tipped, other leg setae pointed. Trochanter ventrally with short lobe. Leg IV (Fig. 2D). Claws and empodium of same shape as on tarsus II. All setae smooth; setae *d* of femur, *pl''* and (*tc*) of tarsus weakly blunt-tipped, other leg setae pointed. Trochanter ventrally with short lobe.



**Figure 4.** *Pavana madagascariensis* sp. nov. (female) – A. Dorsum of body; B. Venter of body. Legs omitted.







**Male** – unknown.

#### *Type material*

Female holotype, slide No. ZISP T-Dol-004, Madagascar, Ankaratra Andraraty, 19° 21' 20.78" S, 47° 18' 18.71" E, on beetle *Helictipleurus quadripunctatus* collected in cow dung, 23.02.2022, A.V. Frolov leg; paratypes: 48 females, same data.

#### *Type deposition*

The holotype and 10 paratypes are deposited in the collection of the Zoological Institute of RAS, Saint Petersburg, Russia; five female paratypes are deposited in the acarological collection of Jalal Afshar Zoological Museum, Department of Plant Protection, Faculty of Agriculture, University of Tehran, Karaj, Iran (JAZM); other paratypes are deposited in the collection of the Tyumen State University Museum of Zoology, Tyumen, Russia.

#### *Differential diagnosis*

The new species is most similar to *Pavania riparia* Sevastianov, 1980 and *P. copridis* Khaustov and Frolov, 2020a by the similar length of idiosomal setae and setae 2c pointed and about twice longer than 2a. The new species differs from both species in having seta *l'* on tibia II spiniform (setiform in *P. riparia* and *P. copridis*) and in having only one tooth-like projection on trochanter I (four in *P. riparia*, five in *P. copridis*).

#### *Etymology*

The name of the new species refers to its geographical distribution.

#### **Key to world species of *Pavania* (based on Khaustov & Frolov 2020b)**

1. Setae *sc1* absent ..... 2
- Setae *sc1* present ..... 9
2. Setae *2b* present ..... 5
- Setae *2b* absent ..... 3
3. Setae *1c* present, seta *d* of femur IV absent ..... 4
- Setae *1c* absent, seta *d* of femur IV present ..... *P. neotropica* Khaustov & Frolov, 2017 (Brazil)
4. Seta *d* of femur III present; setae *d* pointed, distinctly longer than *c2* ..... *P. semireducta* Khaustov & Frolov, 2020a (French Guiana)
- Seta *d* of femur III absent; setae *d* blunt-tipped, distinctly shorter than *c2* ..... *P. brevicaudata* Khaustov & Frolov, 2020a (French Guiana)
5. Seta *d* absent on each femora III and IV ..... 6
- Seta *d* present on each femora III and IV ..... 7
6. All dorsal setae blunt-tipped; setae *c2* only slightly longer than *c1* ..... *P. pusilla* Khaustov & Frolov, 2020a (French Guiana)
- Setae *sc2*, *c2* and *d* pointed; setae *c2* about three times longer than *c1* ..... *P. hansreiaphila* Khaustov & Frolov, 2020a (French Guiana)
7. Setae *v1* shorter than distance between their bases; setae *cha* less than three times longer than *chb*; setae *e* never longer than *f*; setae *h2* at most seven times longer than *h1* ..... 8
- Setae *v1* longer than distance between their bases; setae *cha* three times longer than *chb*; setae *e* longer than *f*; setae *h2* 15 times longer than *h1* ..... *P. gymnopleuri* Hajiqaanbar & Khaustov, 2010 (Iran)
8. Genu I with one seta (*v'*); dorsal idiosomal setae smooth; setae *c1* longer than *c2*; setae *c1* and *d* pointed ..... *P. sabzevarensis* Hajiqaanbar & Khaustov, 2010 (Iran)

- Genu I with two setae ( $v'$ ,  $l'$ ); dorsal idiosomal setae weakly barbed; setae  $c2$  longer than  $c1$ ; setae  $c1$  and  $d$  distinctly blunt-tipped ..... *P. onthophagi* Hajiqanbar & Khaustov, 2010 (Iran)
- 9. Setae  $sc1$  capitate ..... 10
- Setae  $sc1$  seta-like ..... *P. setiformis* Loghmani & Hajiqanbar, 2013 (Iran)
- 10. Setae ( $u$ ) and ( $pv$ ) of tarsus I not lanceolate ..... 14
- Setae ( $u$ ) and ( $pv$ ) of tarsus I lanceolate ..... 11
- 11. Seta  $pv''$  of tarsus III lanceolate ..... 12
- Seta  $pv''$  of tarsus III not modified ..... 13
- 12. Seta  $tc''$  of tarsus II lanceolate, setae  $c2$  distinctly longer than  $c1$  .....  
..... *P. lanceolata* Bahramian & Hajiqanbar, 2015 (Iran)
- Seta  $tc''$  of tarsus II not modified, setae  $c1$  distinctly longer than  $c2$  .....  
..... *P. foliata* Khaustov & Frolov, 2020b (Russia)
- 13. Setae  $c1$ ,  $c2$  and  $d$  pointed; setae  $2c$  distinctly longer than  $2a$  .....  
..... *P. kermaniensis* Hajiqanbar, Khaustov & Mortazavi, 2019 (Iran)
- Setae  $c1$ ,  $c2$  and  $d$  blunt-tipped; setae  $2c$  and  $2a$  subequal .....  
..... *P. scarabaeophilus* Hajiqanbar, Khaustov & Mortazavi, 2019 (Iran)
- 14. Coxal fields II with 3 pairs of setae ..... 15
- Coxal fields II with 2 pairs of setae ..... *P. equisetosa* Mahunka, 1975 (Ghana)
- 15. Empodium on tarsi II-IV small, not exceeding beyond tips of claws ..... 16
- Empodium on tarsi II-IV large, exceeding beyond tips of claws ..... 17
- 16. Seta  $pv'$  on tarsi III and IV thickened, spiniform and blunt-tipped, solenidia on tibiae III and IV absent .....  
..... *P. protracta* Sevastianov, 1980 (Russia)
- Seta  $pv'$  on tarsi III and IV simple, solenidia on tibiae III and IV present .....  
..... *P. tahanae* Sevastianov and Abo-Korah, 1985 (Egypt)
- 17. Setae  $h2$  less than 3.5 times longer than  $h1$  ..... 18
- Setae  $h2$  more than 3.5 times longer than  $h1$  ..... 24
- 18. Setae  $c1$  never reaching beyond bases of setae  $f$ ; setae  $c1$  shorter than  $h2$ ; setae  $d$  shorter than  $h2$  .....  
..... 19
- Setae  $c1$  reaching beyond bases of setae  $f$ ; setae  $c1$  longer than  $h2$ ; setae  $d$  and  $h2$  subequal .....  
..... *P. perhirsuta* Mahunka, 1973 (Ghana)
- 19. Setae  $sc2$  subequal to distance between their bases ..... 21
- Setae  $sc2$  distinctly longer than distance between their bases ..... 20
- 20. Setae  $h2$  more than twice longer than  $h1$ ; posterior margins of tergites C, D, and EF with distinct tooth-shaped projections .....  
..... *P. luisiae* Mahunka, 1974 (Ghana)
- Setae  $h2$  less than twice longer than  $h1$ ; posterior margins of tergites C, D, and EF with very weak projections .....  
..... *P. megasolenidia* Hajiqanbar, Khaustov & Mortazavi, 2019 (Iran)
- 21. Setae  $c1$ ,  $d$ ,  $e$  and  $f$  blunt-tipped ..... 22
- Setae  $c1$ ,  $d$ ,  $e$  and  $f$  pointed ..... *P. bembidii* Khaustov, 2005 (Russia: Crimea)
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## دو گونه جدید (*Pavania* (Acari: Heterostigmata: Dolichocybidae) مرتبط با سوسک‌های اسکاراب (*Coleoptera: Scarabaeidae*) از تانزانیا و ماداگاسکار

آکساندر ای. خاستوف<sup>۱\*</sup> و آندری وی. فرولوف<sup>۲</sup>

۱. دانشگاه ایالتی تیومن، تیومن، خیابان ولودارسکوگو ۶، ۶۲۵۰۰۳ روسیه؛ رایانامه: alex1973khaustov@gmail.com

۲. موسسه جانورشناسی آکادمی علوم روسیه، دانشگاه امبائکمونت ۱، ۱۹۹۰۳۴، سنت پترزبورگ، روسیه؛ رایانامه: afrolov@zin.ru

\* نویسنده مسئول

### چکیده

دو گونه جدید پاونیا (*Pavania* (Acari: Heterostigmata: Dolichocybidae) به صورت هم‌سفر روی سوسک‌های سرگین (*Coleoptera: Scarabaeidae*) *P. neoaficana* **sp. nov.** روی *Helicoprion neptunus* در تانزانیا و *P. madagascariensis* **sp. nov.** جمع‌آوری شده از روی *Helictipleurus quadripunctatus* در ماداگاسکار توصیف شده‌اند. کلید به روز شده برای گونه‌های جنس *Pavania* ارائه شده است. خانواده Dolichocybidae برای نخستین بار از ماداگاسکار گزارش می‌شود.

**واژگان کلیدی:** ناحیه افروتروپیکال؛ سوسک سرگین؛ کلید؛ هم‌سفری؛ رده‌بندی.

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