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Two new species of microdispid mites (Acari: Heterostigmata: Pygmephoroidae) associated with *Lucanus ibericus* (Coleoptera: Lucanidae)

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Original research

ABSTRACT

Two new species of the microdispid mites (Acari: Microdispidae) phoretic on *Lucanus ibericus* are described from Iran: *Premicrodispus gorganiensis* Rahiminejad & Seyedein **sp. nov.** and *Neomicrodispus lucani* Rahiminejad & Seyedein **sp. nov.** The mites were collected from forests with Hornbeam trees (*Carpinus* spp.) and Oak trees (*Quercus* spp.) in Gorgan, northern Iran. The distribution of the heterostigmatic mites on lucanid beetles is reviewed. Also, a key to species of the *Neomicrodispus* is provided.

Keywords Microdispidae; forest; fauna; Insect; phoresy; stag beetle; Iran

Zoobank <http://zoobank.org/7FD7D3DB-1488-4C29-9519-AD8B6262D005>

Introduction

Although many of heterostigmatic mites (Acari: Prostigmata) prefer to be free-living, almost all of them take advantage of phoresy in some periods of their life to distribute and establish their populations (Hermann *et al.* 1970; Kaliszewski *et al.* 1995). Heterostigmata have a wide range of associations with arthropods, including predation, parasitism and mutualism; so that different host-symbiont interactions could lead to speciation (Okabe *et al.* 2012). More than 2000 described species in eight superfamilies are classified in Heterostigmata (Walter *et al.* 2009; Zhang *et al.* 2011). The four families Microdispidae, Scutacaridae, Neopygmephoridae and Pygmephoridae constitute the largest superfamily in Heterostigmata (Acari: Prostigmata), known as Pygmephoroidae (Khaustov 2004). The least diverse family in the superfamily, Microdispidae Cross, 1965, includes 28 described genera and more than 120 species (Khaustov and Minor 2020) that are mostly fungivorous, inhabiting soil, litter, mosses or decaying plant material, and some are in relation with various arthropods by phoresy or parasitism with the most prevalent hosts for this family being beetles and ants (Kaliszewski *et al.* 1995; Walter *et al.* 2009; Hajiqanbar *et al.* 2012a; Rahiminejad *et al.* 2015a; Khaustov and Minor 2020). The taxonomic placement of many microdispid mites was as doubtful, hereupon, Khaustov (2018) provided a key for genera. There are various reports about microdispid mites in Iran (Rahiminejad *et al.* 2010, 2015a; Hajiqanbar *et al.* 2012a, b; Hosseiniaveh *et al.* 2013, 2015; Loghmani *et al.* 2014a, b; Katlav *et al.* 2015; Hajiqanbar and Hosseiniaveh 2014; Filekesh *et al.* 2014; Abbasi-Moghadam *et al.* 2014; Badoodam *et al.* 2015; Azhari *et al.* 2018; Hajiqanbar and Arjomandi 2019; Rahiminejad and Hajiqanbar 2020). Until now, six genera and 23 species have been recorded from Iran (Hajiqanbar and Sobhi 2018).

A very diverse group of scarabaeoid beetles (Coleoptera: Scarabaeoidea), including Lucanidae, could be identified as hosts for microdispid mites (Kaliszewski *et al.* 1995; Walter

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et al. 2009; Hajiqanbar and Sobhi 2018; Khaustov and Frolov 2018). Lucanid beetles feed on honeydew or on sap from leaves and trees in their adult stage and their larvae breed in or beneath the decaying wood of logs or stumps (Holloway 2007).

During a survey on mite fauna of the cohort Heterostigmata associated with insects in Golestan province, Northern Iran, in summer 2019, two new species of the genera *Premicrodispus* and *Neomicrodispus* phoretic on beetles (Coleoptera: Lucanidae) were collected by light trap. The aim of this paper is to describe these new species. In addition, the representatives of the Heterostigmata associated with lucanid beetles are reviewed. A key for species of the genus *Neomicrodispus* is provided as well.

Materials and methods

Host beetles were captured by light trap in Alangdareh Forest, in Golestan province, northern Iran, during summer 2019. Mite specimens were cleared in lactophenol and mounted in Hoyer's medium. The morphology of the mites was studied by a light microscope with phase contrast illumination (Olympus BX51, Tokyo, Japan). The terminology of the idiosoma and legs follows that of Lindquist (1986), the designation of cheliceral setae follows Grandjean 1947 and the nomenclature of subcapitular setae follows Grandjean (1944). All measurements in the descriptions are given in micrometers (μm) for the holotype and four paratypes (in parentheses). Details of geographical position were recorded using a global positioning system (GPS model: eTrex).

The beetle host was identified by the help of a key for Iranian lucanid beetles provided by Bartolozzi *et al.* (2014).

The type materials of the new species and host beetles are deposited in the Arthropods Collection, Acari section, Department of Plant Protection, Faculty of Plant Production, Gorgan University of Agricultural Science and Natural Resource, Golestan, Iran.

Systematics

Family Microdispidae Cross, 1965

Genus *Premicrodispus* Cross, 1965

Type species: *Microdispus* (*Premicrodispus*) *chandleri* Cross, 1965, by original designation

Three subgenera, *Premicrodispus* Cross, 1965, *Premicrodispulus* Khaustov & Chydyrov, 2010, *Premicrodispoides* Khaustov & Maslov, 2013, and about 31 species constitute the cosmopolitan genus *Premicrodispus* (Khaustov and Minor 2020). Khaustov (2006) provided the diagnosis of the genus.

***Premicrodispus gorganiensis* Rahiminejad & Seyedein sp. nov.**

Zoobank: 686F49BC-B7F0-409F-A406-96217D5A4CCA

(Figures 1–3)

Diagnosis — The new species is characterized by posterior margin of tergites C and D with a distinct median incision; setae *d*, *e* and *f* blunt-ended; setae *e* not associated with ridge; distance *d*–*d* about 1.5 times longer than seta *d*; seta *h*₁ less than 1.5 times longer than *h*₂; seta *4a* absent and seta *ps*₂ present; tibiotarsus I with four solenidia; all dorsal setae extending posterior border of their tergites; cupuli *ia* and *ih* rhombic.

Description — **Female.** Length of body (including gnathosoma) 236 (229–241), width 121 (118–125).

Gnathosoma (Figs 1A & B)— gnathosomal capsule elongated, dorsally with one pair of cheliceral setae, *cha* 11 (10–11). Palpal femorogenu with subequal setae *dFe* 5 (5–6) and *dGe* 7 (6–8). Gnathosoma ventrally with one pair of subcapitular setae *m* 11 (10–11). Pharyngeal

Figure 1 *Premicrodispus gorganiensis* sp. nov., female. A – body in dorsal view, B – body in ventral view, C – pharyngeal system.

system well sclerotized (Fig. 1C), including three pumps, pump 2 developed with transversely striate and pumps 1 and 3 vestigial.

Idiosomal dorsum (Fig. 1A) – Body elliptic, all tergites smooth; stigmata oval and associated with thin tracheal trunks; all dorsal setae smooth; setae *d*, *e* and *f* blunt-ended, other dorsal setae pointed; prodorsal shield with elliptic stigmata, trichobothria with long stem, clavate and sparsely barbed, setae *sc*₂ 36 (32–37); tergite C with two pairs of setae *c*₁ 21 (20–24) and *c*₂ 32 (30–35), setae *c*₂ longer than *c*₁, posterior border of tergites C and D with distinct median incision; tergite D with setae *d* 18 (17–19), and cupuli *ia* rhombic and situated postero-laterad setae *d*; tergite EF with two pairs of setae *e* 14 (13–14) and *f* 23 (21–24), bases of setae *e* not associated with linear ridge; tergite H with setae *h*₁ 21 (20–22), *h*₂ 16 (15–16), cupuli *ih* rhombic and situated posteriad setae *h*₂; distance *h*₁–*h*₁ subequal to *h*₁–*h*₂; all dorsal setae reach to posterior border of their tergites. Distances between dorsal setae: *sc*₂–*sc*₂ 37 (35–39), *c*₁–*c*₁ 45 (41–48), *c*₂–*c*₂ 80 (79–83), *c*₁–*c*₂ 22 (20–23), *d*–*d* 31 (30–32), *e*–*e* 80 (76–84), *e*–*f* 11 (10–12), *f*–*f* 45 (44–48), *h*₁–*h*₁ 18 (18–20), *h*₂–*h*₂ 57 (54–58), *h*₁–*h*₂ 19 (19–20).

Idiosomal venter (Fig. 1B) – Apodemes 1 (ap1) and 2 (ap2) well developed and joined with prosternal apodeme (appr), sejugal apodeme (apsej) thick, well sclerotized and joined with

appr; all ventral plates smooth; all ventral setae pointed and smooth; setae 4a absent; anterior margin of posterior sternal plate straight, without lobe; apodemes 3 (ap3) extending beyond bases of setae 3a; apodemes 4 (ap4) short and reaching to bases of setae 3b; apodemes 5 absent; posterior margin of posterior sternal plate tripartite; coxal field I with setae 1a 11 (11–12), 1b 16 (15–17); coxal field II with setae 2a 11 (11–12), 2b 11 (10–12); coxal field III with setae 3a 14 (13–14), 3b 11 (9–11), 3c 16 (16–18); coxal field IV with setae 4b 14 (13–15) and 4c 11 (11–12), setae 1b and 3c subequal and longest on idiosomal venter; pseudanal plate with setae ps_1 17 (16–18), ps_2 9 (8–9) and ps_3 31 (30–34).

Legs (Figs 2, 3) – Leg I (Fig. 2A). Thinner and shorter than other legs. Setal formula: (number of solenidia in parentheses): Tr1–Fe3–Ge4–TiTa15 (4). Tibiotarsus I with seta k and five other blunt-ended eupathidial setae (p'' , tc' , tc'' , ft' and ft''), solenidion ω_1 6 (6–7) digitiform, solenidion ω_2 3 (3–3) baculiform, solenidion ϕ_1 3 (2–3) weakly clavate, ϕ_2 3 (2–3) baculiform, setae pl' and pl'' whip-like; genu with three barbed setae and seta l'' smooth; femur with setae d , v'' and l' subequal. Leg II (Fig. 1B). Setal formula: Tr1–Fe3–Ge3–Ti4(1)–Ta6(1).

Figure 2 *Premicrodispus gorganiensis* sp. nov., female. A – leg I, B – leg II.

Figure 3 *Premicrodispus gorganiensis* sp. nov., female. A – leg III, B – leg IV.

Tarsus with sickle-like simple claws, solenidion ω 4 (3–4) digitiform, seta pl'' shortest on tarsus I; tibia with solenidion ϕ 3 (2–3) weakly clavate, setae v' and v'' subequal and longer than two others; genu with setae l' thickened; femur with setae l' and d , shortest and longest setae on leg II, respectively; trochanter with seta v' as long as v' on first leg. Leg III (Fig. 3A). Setal formula: Tr1–Fe2–Ge2–Ti4(1)–Ta6. All leg setae smooth and pointed; tibia with solenidion ϕ 3 (2–3) digitiform, seta l' shorter than three others; genu with two subequal setae l' and v' ; femur divided into basi- and telofemur with seta d longer than seta v' ; trochanter with seta v' longer than femoral seta v' . Leg IV (Fig. 3B). Setal formula: Tr1–Fe2–Ge1–Ti4(1)–Ta6. Setae tc' thickened; tibia with solenidion ϕ 3 (2–3) digitiform, seta v'' on tibia and tc' on tarsus are shortest and longest on leg IV, respectively; genu with seta v' as long as seta v'' on tibia;

femur divided into basi- and telofemur with seta v' longer than d ; trochanter with seta v' longer than v' on femur.

Male and larva. Unknown.

Differential diagnosis — The new species is most similar to *Premicrodispus spinosus* Hosseininaveh & Hajiqanbar, 2015 by seta $4a$ absent, seta ps_2 present, seta ps_3 longer than ps_1 and seta ps_1 longer than ps_2 , setae d and f blunt-ended, but differs in having tarsi and tibiae II and III with simple setae (tarsi and tibiae II and III with spine-like setae in *P. spinosus*) and seta e with no linear ridge (setae e associated with a linear ridge in *P. spinosus*). On the other hand, the new species is similar to *P. tenuisetus* Khaustov, 2006 and *P. novaezealandicus* Khaustov and Minor, 2020 by absence of setae $4a$ and presence of setae ps_2 , but differs from them by setae d , e and f blunt-ended (setae d , e and f pointed in *P. tenuisetus*), setae e shorter than f (setae e longer than f in *P. novaezealandicus* and subequal with f in *P. tenuisetus*), setae e not associated with ridge (setae e associated with well-developed oblique ridges in *P. tenuisetus*), pump 3 of pharyngeal system reduced (pump3 of pharyngeal system ovate in *P. novaezealandicus* and *P. tenuisetus*), seta ps_1 two times longer than ps_2 (seta ps_1 and ps_2 subequal in *P. novaezealandicus*), seta ps_3 longer than ps_1 and seta ps_1 longer than ps_2 (setae ps_3 and ps_1 subequal and longer than seta ps_2 in *P. tenuisetus*), posterior border of tergites C and D with distinct median incision (posterior border of tergites C and D straight in *P. novaezealandicus* and *P. tenuisetus*).

Type material — Female holotype (VRSS-20190812-1) and 5 female paratypes, in a vial containing *Lucanus ibericus* Motschulsky, 1845 (Col.: Lucanidae). The hosts were captured by a light trap from Alangdareh forest, with Hornbeam trees (*Carpinus* spp.) and Oak trees (*Quercus* spp.), Gorgan town, Golestan province, northern Iran, 36.46°N, 54.26°E, altitude, 408 m., coll. V. Rahiminejad, 12 August 2019.

Etymology — The name of the new species refers to its sampling site, the city of Gorgan, northern Iran.

Genus *Neomicrodispus* Hajiqanbar & Hosseininaveh, 2014

Type species: *Neomicrodispus iranicus* Hajiqanbar & Hosseininaveh, 2014, by original designation.

Type species along with *N. sibiriensis* Khaustov, 2018, constitute the genus (Hajiqanbar and Hosseininaveh 2014; Khaustov 2018).

Neomicrodispus lucani Rahiminejad & Seyedein sp. nov.

Zoobank: AC91F8E7-794C-4C96-B19C-97A7FD76E88C

(Figures 4–6)

Diagnosis — The new species is characterized by having all dorsal setae pointed and sparsely barbed; setae $4a$ absent; setae cha and m subequal; setae e and h_2 subequal; setae ps_1 and ps_3 subequal and two times longer than ps_2 .

Description — **Female.** Length of body (including gnathosoma) 182 (175–184), width 98 (94–103).

Gnathosoma (Figs 4A & B) – Length of gnathosoma 23 (22–23), width 15 (14–15); without dorsal median apodeme; cheliceral setae cha 11 (10–12) smooth and pointed; postpalpal setae (pp) 3 (3) needle-like, located laterad bases of cha . Setae dFe 7 (6–7) and dGe 4 (3–4) smooth, pointed, dFe longer than dGe ; subcapitular setae m 10 (10–11) smooth and pointed; accessory setigenous structure indiscernible; pharyngeal pump system (Fig. 4C) with three pumps, second pharyngeal pump large, subrectangular and transversely striated, pharyngeal pumps 1 and 3 reduced and bow-shaped; pharyngeal pump 1 clearly separated from pharyngeal pump 2.

Idiosomal dorsum (Fig. 4A) – Body oval; prodorsum only slightly covered by anterior part of tergite C; oval stigmata and related tracheal trunks visible; trichobothria with long stem, clavate, weakly barbed, with two short apical projections; seta sc_2 24 (23–27), barbed; idiosomal length 155 (147–158); posterior margins of tergites C, D, EF and H tanned and with

row of U-shaped elevations; all dorsal hysterosomal setae sparsely barbed and pointed; tergite C with two pairs of setae c_1 38 (36–39) and c_2 38 (35–39), setae c_1 and c_2 subequal; tergite D with setae d 40 (36–41), cupuli ia indiscernible; tergite EF with two pairs of setae e 17 (17–18) and f 39 (37–41), bases of setae e not associated with ridges and one pair of round porous areas situated besides the base of setae e , distance $e-f$ subequal to $f-f$; tergite H with setae h_1 31 (29–32), h_2 16 (15–16), cupuli ih round and placed posteriad seta h_2 ; all dorsal setae extended from posterior border of their tergites. Distances between dorsal setae: sc_2-sc_2 33 (30–34), c_1-c_1 29 (28–32), c_2-c_2 74 (70–77), c_1-c_2 21 (20–23), $d-d$ 20 (18–21), $e-e$ 61 (59–66), $e-f$ 19 (18–21), $f-f$ 21 (20–22), h_1-h_1 32 (30–33), h_2-h_2 51 (50–53), h_1-h_2 9 (9–10).

Idiosomal venter (Figs. 4B) – All apodemes (ap1 to ap4, apsej, appr and appo) well developed, except ap5, absent; ap3 extending beyond bases of setae 3a; ap4 reach to bases of setae 3b; ventral plates smooth. All ventral setae pointed and weakly barbed except smooth 4b;

Figure 4 *Neomicrodispus lucani* sp. nov., female. A – body in dorsal view, B – body in ventral view, C – Pharyngeal system.

Figure 5 *Neomicrodispus lucani* sp. nov., female. A – leg I, B – leg II.

Legs (Figs 5 & 6) – Leg I (Fig. 5A). Setal formula: (number of solenidia in parentheses): Tr1–Fe3–Ge4–TiTa15 (3). Tibiotarsus with five eupathidial setae tc' , tc'' , fl' , fl'' and p'' , setae

Figure 6 *Neomicrodispus lucani* sp. nov., female. A – leg III, B – leg IV.

tc' shorter than tc'' , setae pv' , v' , l'' and pl'' barbed, other leg setae smooth, solenidia ω_1 9 (8–9) $> \varphi_1$ 7 (6–7) $> \varphi_2$ 3 (3–4), solenidium ω_1 weakly clavate, longer than other solenidia, solenidium φ_1 clubbed, solenidium φ_2 baculiform; genu with setae v' and v'' barbed and subequal to l'' and shorter than l' ; femur with setae d barbed and longer than subequal v'' and l' ; seta v' on trochanter shortest setae of leg. Leg II (Fig. 5B). Setal formula: Tr1–Fe3–Ge3–Ti4(1)–Ta6(1). Tarsus with setae tc'' and u' smooth and subequal, other setae of segment barbed, solenidium ω 8 (7–8) digitiform; all setae on tibia barbed except smooth d , setae d shorter than other

tibial setae, solenidion ϕ 4 (3–4) digitiform; genu with setae v' barbed and longer than setae l'' and l' ; all setae on femur smooth, setae l' and v'' subequal and distinctly shorter than seta d ; seta v' on trochanter barbed and longer than v' of genu. Leg III (Fig. 6A). Setal formula: Tr1–Fe2–Ge2–Ti4(1)–Ta6. All setae on tarsus smooth except barbed pv' ; all setae on tibia subequal and barbed except smooth d , solenidion ϕ 3 (3–4) weakly clavate; genu with setae v' and l' subequal, seta v' barbed; seta v' on femur barbed and subequal with smooth v' ; trochanter with seta v' smooth and longer than v' on femur. Leg IV (Fig. 6B). Setal formula: Tr1–Fe2–Ge1–Ti3–Ta6. Longer than other legs. Tarsus with setae u' , pv' and tc' barbed, seta pl'' shortest and tc' longest setae of segment; all setae on tibia barbed except smooth l' , seta d longest on segment; pore-like structure visible below base of seta d ; genu with seta v' barbed; femur with seta d more than twice longer than v' , both barbed; seta v' on trochanter smooth and slightly longer than femoral seta v' .

Male and larva. Unknown.

Differential diagnosis — The new species can be distinguished from *N. sibiriensis* by the absence of setae 4a (present in *N. sibiriensis*). Also *N. lucani* sp. nov. differs from *N. iranicus* by seta *cha* and *m* subequal (seta *cha* two times longer than *m* in *N. iranicus*), seta *e* and h_2 subequal (seta *e* more than 1.5 times longer than h_2 in *N. iranicus*), setae ps_1 and ps_3 subequal and two times longer than ps_2 (setae ps_{1-3} subequal in *N. iranicus*).

Type material — Female holotype (VRSS-20190705-8) and three female paratypes, in the vial containing *Lucanus ibericus* Motschulsky, 1845 (Col.: Lucanidae). The hosts captured by a light trap from Alangdareh forest, with Hornbeam trees (*Carpinus* spp.) and Oak trees (*Quercus* spp.), Gorgan town, Golestan province, northern Iran, 36.46°N, 54.26°E, altitude, 408 m., coll. V. Rahiminejad, 5 July 2019.

Etymology — The name of the new species refers to generic name of the host beetle, *Lucanus*.

Remark — This is the first record of association between *Neomicrodispus* mites and lucanid beetles. Previously, *N. iranicus* was found in a vial containing beetle *Oryctes nasicornis* (L.) (Col.: Scarabaeidae) in northern Iran and *N. sibiriensis* collected from a decaying tree stump in Western Siberia, Russia.

Discussion

Stag beetles (Col.: Lucanidae) with about 1700 species, have a worldwide distribution (Bartolozzi *et al.* 2014). Ten species of lucanid beetles are listed for the arthropod fauna of Iran and it seems that *Lucanus ibericus* is the dominant lucanid beetle in northern Iran. This beetle feeds for several (3–7) years on decaying wood of stumps and roots in its larval stage, and the adults are related with leaves, litter and trees, therefore, it could be possible that the beetles had a close association with wide range of mites in soil or on the trees (Walter *et al.* 2009; Harvey *et al.* 2011; Okabe *et al.* 2012; Bartolozzi *et al.* 2014). Mite fauna associated with Lucanidae is poorly studied. Hitherto, three orders of mites (Mesostigmata, Trombidiformes and Sarcoptiformes) have been found to be associated with the beetles (Haitlinger 2008; Walter *et al.* 2009). Until now, nine species belonging to five genera and two families of Heterostigmata have been recorded as phoretic on three different species of lucanid beetle, *L. ibericus*, *Dorcus parallelipedus* (L.) and *D. parallelus* (Say, 1823) (Table 1).

As *N. iranicus* was collected from *Oryctes nasicornis* (Scarabaeidae), *N. sibiriensis* extracted from a decaying stump and *N. lucani* sp. nov. found in association with *L. ibericus*, it seems that a range of arthropods that dwell in decaying wood habitats could be chosen as a hosts for *Neomicrodispus* mites. However, more investigations on the biology and life history of *Neomicrodispus* can clear the nature of the associations.

Presently, the genus *Neomicrodispus* includes three described species based only on females that could be separated by the following key.

Table 1 List of heterostigmatic mites associated with stag beetles.

Mite species	Family	Lucanid host	Reference(s)
<i>Metapygmephorus colydius</i> Rahiminejad & Hajiqaanbar, 2015	Pygmephoridae	<i>D. parallelipipedus</i>	Rahiminejad et al. (2015b)
<i>Propygmephorus crossi</i> Katlav & Hajiqaanbar, 2016	Pygmephoridae	<i>L. ibericus</i>	Hajiqaanbar and Arjomandi (2019)
<i>Premicrodispus turkmenus</i> Badoodam & Hajiqaanbar, 2015	Microdispidae	<i>L. ibericus</i>	Badoodam et al. (2015)
<i>Premicrodispus paramaevi</i> Hosseininaveh & Hajiqaanbar, 2014	Microdispidae	<i>L. ibericus</i>	Hosseininaveh et al. (2014)
<i>Paramicrodispus scarabidophilus</i> Hajiqaanbar & Rahiminejad, 2012	Microdispidae	<i>D. parallelus</i>	Badoodam et al. (2015)
<i>Paramicrodispus crenulatus</i> (Sevastianov, 1978)	Microdispidae	<i>L. ibericus</i>	Hajiqaanbar et al. (2012)
<i>Premicrodispus longicaudus</i> Khaustov, 2006	Microdispidae	<i>L. ibericus</i>	Rahiminejad and Hajiqaanbar (2020)
<i>Premicrodispus gorganiensis</i> Rahiminejad sp. nov.	Microdispidae	<i>L. ibericus</i>	Current Study
<i>Neomicrodispus lucani</i> Rahiminejad sp. nov.	Microdispidae	<i>L. ibericus</i>	Current Study

1. Setae *e* shorter than *f*; setae *ps*₁ and *ps*₃ subequal and two times longer than *ps*₂
..... *N. lucani* Rahiminejad & Seyedein **sp. nov.**
— Setae *e* and *f* subequal; setae *ps*₁, *ps*₂ and *ps*₃ subequal 2
2. Seta 4*a* present, dorsal hysterosomal setae longer (*d* 40, *f* 42, *h*₁ 35)
..... *N. sibiricus* Khaustov, 2018
— Seta 4*a* absent, dorsal hysterosomal setae relatively shorter (*d* 30, *f* 32, *h*₁ 23)
..... *N. iranica* Hajiqaanbar & Hosseininaveh, 2014

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References

- Abbasi-Moqadam F., Hajiqaanbar H., Katlav A. 2014. First record of *Unguiculus okumurai* (Acari: Microdispidae), as a new genus and species to mite fauna of Iran. In: Rahimian, H. (Ed.), Abstract book of the 21th Iranian Plant Protection Congress, Urmia, Iran, p. 959.
- Azhari Sh., Hajiqaanbar H., Talebi A.A. 2018. First record of the rare genus *Punicodoxa* (Acari: Microdispidae) from Asia, with description of a new species phoretic on termites (Insecta: Isoptera). Syst. Appl. Acarol., 23(3): 468-476. doi:10.11158/saa.23.3.6
- Badoodam S., Hajiqaanbar H., Talebi A.A. 2015. New species and records of the family Microdispidae (Acari: Prostigmata) from Golestan province, Iran. Internat. J. Acarol., 41 (7): 600-605. doi: 10.1080/01647954.2015.1084047
- Bartolozzi L., Ghahari H., Sprecher-Uebersax E., Zilioli, M. 2014. A checklist of stag beetles (Coleoptera: Scarabaeoidea: Lucanidae) from Iran. Zootaxa, 3887(3): 422-436. doi:10.11646/zootaxa.3887.4.2
- Filekesh M., Hajiqaanbar H., Jabaleh I. 2014. New records of three species of the superfamily Pygmephoridae (Acari: Heterostigmata) from Asia. Pers. J. Acarol., 3: 277-283. doi:10.22073/pja.v3i4.10170
- Grandjean F. 1944. Observations sur les Acariens de la famille des Stigmaeidae. Arch. Sci. Phys. Natur., 26: 103-131.
- Grandjean, F. 1947. L'origine pileuse des mors et la chaetotaxie de la mandibule chez les Acariens actinotrichiens. Comptes rendus des Séances de l'Académie des Sciences, 224: 1251-1254.
- Haitlinger R. 2008. Mites associated with insects in Poland. In: Gwiazdowicz, D.J. (ed) Selected problems of acarological research in forests. 113-115. Wydawnictwo Uniwersytetu Przyrodniczego, Poznan. 125 pp.
- Hajiqaanbar, H., Rahiminejad, V. & Fathipour, Y. (2012a) New insect host records for mites of the family Microdispidae (Acari: Heterostigmata), with description of a new species of the genus *Paramicrodispus*. Entomol. Sci., 15(3): 309-313. doi:10.1111/j.1479-8298.2012.00515.x

- Hajiqanbar, H., Salarzahi, S., Olyaie Torshiz, A. & Noei, J. (2012b) First record of the *Premicrodispus lineatus* (Mahunka, 1986) (Acari: Heterostigmata, Microdispidae) from Iran. Pers. J. Acarol., 1 (2): 157-158. doi:10.1111/j.1479-8298.2012.00515.x
- Hajiqanbar H., Hosseiniaveh F. 2014. A new genus and species of the family Microdispidae (Acari: Prostigmata) associated with *Oryctes nasicornis* (Coleoptera: Scarabaeidae) and redescription of the monotypic genus *Vietodispus* Mahunka, 1975. Zool. Stud., 53: 58. doi:10.1186/s40555-014-0058-7
- Doi: 10.1186/s40555-014-0058-7 doi:10.1186/s40555-014-0058-7
- Hajiqanbar H., Arjomandi E. 2019. Heterostigmatic mites (Acari: Trombidiformes: Prostigmata) associated with Coleoptera and Hymenoptera in Mazandaran province, northern Iran. Pers. J. Acarol., 8 (4): 343-352. doi:10.22073/pja.v8i4.56685
- Hajiqanbar H., Sobhi M. 2018. New records of the microdispid mites (Acari: Heterostigmata: Microdispidae) associated with ants with a review of the family in Iran. Pers. J. Acarol., 7(2): 105-113.
- Harvey D.J., Hawes C.J., Gange A.C., Finch P., Chesmore D., Farr, I. 2011. Development of non-invasive monitoring methods for larvae and adults of the stag beetle, *Lucanus cervus*. Insect Conserv. Diver., 4: 4-14. doi:10.1111/j.1752-4598.2009.00072.x
- Hermann H.R., Blum M.S., Hunt A.N. 1970. Myrmecophilous arthropods associated with imported fire ant, *Solenopsis saevissima* (Hymenoptera: Formicidae). l'Académie des Sciences, 33: 13-18.
- Holloway B.A. 2007. Lucanidae (Insecta: Coleoptera). Fauna of New Zealand, 61, 254 pp.
- Hosseiniaveh F., Hajiqanbar H., Talebi A.A. 2013. First record of the *Premicrodispus akermanae* (Sevastianov and Al Douri, 1988) (Acari: Microdispidae) from Iran. In: Joharchi, O. & Saboori, A. (Eds.), Abstract book of the 2nd International Persian Congress of Acarology, Tehran, Iran, p. 15.
- Hosseiniaveh F., Hajiqanbar H., Talebi A.A. 2015. Two new species of the genus *Premicrodispus* (Acari: Microdispidae) associated with beetles (Coleoptera: Lucanidae, Tenebrionidae), with a key to Palaearctic species of the genus. J. Nat. Hist., 49: 915-931. doi:10.1080/00222933.2014.953225
- Kaliszewski M., Athias-Binche F., Lindquist E.E. 1995. Parasitism and parasitoidism in Tarsonemina (Acari: Heterostigmata) and Evolutionary Considerations. Adv. Parasitol., 35: 335-67. doi:10.1016/S0065-308X(08)60074-3
- Katlav A., Hajiqanbar H., Talebi A.A. 2015. A contribution to the knowledge of heterostigmatic mites (Acari: Prostigmata) in western Mazandaran Province, Northern Iran. Acarologia 55(3): 311-320. doi:10.1051/acarologia/20152175
- Khaustov A.A. 2004. Mites of the family Neopygmephoridae Cross, 1965 stat. n. and their position in Heterostigmata. In: Balashov Y.S. (Ed.), VIII Russian Acarological Conference, St.Petersburg. Zoological Institute of RAS, St.Petersburg, p. 137. [in Russian]
- Khaustov A.A. 2006. A review of the genera *Premicrodispus* Cross, 1965 and *Dolichodispus* gen. nov. (Acari: Microdispidae) of Crimea. Acarina, 14 (2): 155-174.
- Khaustov A.A. 2018. First record of the genus *Neomicrodispus* (Acari: Microdispidae) from Russia with the description of a new species and a key to world genera of the family Microdispidae. Acarina, 26 (2): 175-182. doi:10.21684/0132-8077-2018-26-2-175-182
- Khaustov A.A., Frolov A.V. 2018. A new species, new genus and new records of heterostigmatic mites (Acari: Heterostigmata) phoretic on scarab beetles of the subfamily Orphninae (Coleoptera: Scarabaeidae). Zootaxa, 4514 (2): 181-201. doi:10.11646/zootaxa.4514.2.3
- Khaustov A.A., Minor M.A. 2020. New species of Microdispidae (Acari: Heterostigmata) from alpine New Zealand. Zootaxa, 4750 (4): 477-498. doi:10.11646/zootaxa.4750.4.2
- 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. Entomol. Soc. Can., 118: 1-517. doi:10.4039/entm118136fv
- Loghmani A., Hajiqanbar H., Talebi, A.A. 2014a. New records of mites of the superfamily Pygmephoroidae (Acari: Heterostigmata) associated with insects from northeastern Iran and new host records. Syst. Appl. Acarol., 19(2): 154-159. doi:10.11158/saa.19.2.5
- Loghmani A., Hajiqanbar H., Talebi A. 2014b. New species and new record of the genus *Caesarodispus* (Acari: Heterostigmata: Microdispidae) phoretic on *Temnothorax* sp. (Hymenoptera: Formicidae) with a key to world species of the genus. Ann. Zool., 64: 273-278. doi:10.3161/000345414X680627
- Okabe K., Masuya H., Kanzaki N. 2012. Regional collapse of symbiotic specificity between lucanid beetles and canestriniid mites. Naturwissenschaften, 99: 959-965. doi:10.1007/s00114-012-0979-0
- Rahiminejad V., Hajiqanbar H., Fathipour Y. 2010. First record of phoresy of Microdispidae (Acari: Prostigmata) on Scarabaeidae (Insecta: Coleoptera). In: Manzari S. (ed.) Proceedings of 19th Iranian Plant Protection Congress. Iranian Research Institute of Plant Protection Press, Tehran, p 352.
- Rahiminejad V., Hajiqanbar H., Talebi A. 2015a. Three new species of the genus *Caesarodispus* (Acari: Microdispidae) associated with ants (Hymenoptera: Formicidae), with a key to species. Entomol. Sci., 18: 461-469. doi:10.1111/ens.12149
- Rahiminejad V., Hajiqanbar H., Khaustov A., Talebi A. 2015b. A New Genus and Two New Species of the Family Pygmephoridae (Acari: Heterostigmata) Associated with Beetles (Insecta: Coleoptera). Ann. Entomol. Soc. Am., 108(5): 893-901. doi:10.1093/aesa/sav073
- Rahiminejad V., Hajiqanbar H. 2020. New records of mites of the Heterostigmata (Acari: Prostigmata) associated with insects from Golestan province, northern Iran. Pers. J. Acarol., in press.
- Walter D.E., Lindquist E.E., Smith I.M., Cook D.R., Krantz G.W. 2009. Order Trombidiformes. In: Krantz, G.W. & Walter, D.E. (eds.) A Manual of Acarology. Texas, Texas Tech University Press, USA, pp. 233-420.
- Zhang Z.Q., Fan Q.H., Pesic V., Smith H., Bochkov A.V., Khaustov A.A., Baker A., Wohltmann A., Wen T., Amrine J.W., Beron P., Lin J., Gabrys G., Husband R. 2011. Order Trombidiformes Reuter, 1909. In: Zhang Z.Q. (Ed.), Animal biodiversity: An outline of higher-level classification and survey of taxonomic richness, pp. 129-138. Magnolia Press. doi:10.11646/zootaxa.3148.1.24