

## ORIGINAL ARTICLE

Three new species of the genus *Caesarodispus* (Acari: Microdispidae) associated with ants (Hymenoptera: Formicidae), with a key to species

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**Abstract**

Three new species of the genus *Caesarodispus* (Acari: Heterostigmata: Microdispidae) phoretic on ants are described from Iran: *C. khaustovi* Rahiminejad & Hajiqanbar **sp. nov.**, *C. pheidolei* Rahiminejad & Hajiqanbar **sp. nov.** and *C. nodijensis* Rahiminejad & Hajiqanbar **sp. nov.** All species were associated with alate ants of the subfamily Myrmicinae (Hymenoptera: Formicidae) from northern Iran. A key to all species of *Caesarodispus* is provided.

**Key words:** Heterostigmata, host range, Iran, mite, phoresy.

**INTRODUCTION**

Phoresy is a common form of migration in mites and, in myrmecophilous species, phoresy usually occurs on alate ants (Hymenoptera: Formicidae) (Hermann *et al.* 1970). At least 17 families of mites are associated with ants, the most common being the uropodine families Oplitidae, Trachyuropodidae and Uropodidae (Mesostigmata), the Laelapidae (Mesostigmata) and the Histiosomatidae (Sarcoptiformes). The Heterostigmata (Trombidiformes: Prostigmata) is a diverse and distinctive group of trombidiform mites that have phoretic, parasitic and parasitoid relationships with insects. Ants are no exception, with Scutacaridae, Neopygmephoridae, Pygmephoridae, Tarsonemidae and Microdispidae all recorded from ants (Moser & Blomquist 2011).

The Microdispidae Cross, 1965 comprises more than 110 described species in 18 genera (Zhang *et al.* 2011; Hajiqanbar & Hosseiniaveh 2014). Microdispid mites are mostly fungivorous and, like many families of the Heterostigmata, usually migrate by phoresy

(Kaliszewski *et al.* 1995; Walter *et al.* 2009). The most prevalent hosts for this family are beetles and ants. Specific relationships between phoretic microdispid mites and their phoronts are generally restricted to one family or a few host genera: for instance, all mites of the genus *Caesarodispus* Mahunka, 1977 are associated with ants of the genera *Myrmica*, *Messor*, *Tetramorium*, *Temnothorax*, *Solenopsis* and *Crematogaster*, all belonging to the subfamily Myrmicinae (Loghmani *et al.* 2014). On the other hand, some genera have a wider host range: for example, the genus *Paramicrodispus* Khaustov, 2009 has been found on centipedes of the family Scolopendridae and beetles of the families Carabidae, Scarabaeidae and Lucanidae (Khaustov 2009; Hajiqanbar *et al.* 2012).

Until now, the genus *Caesarodispus* contained nine described species: *C. samsinaki* (Mahunka, 1967) from the Czech Republic, Ukraine, Belarus and Russia (Sevastianov 1978; Khaustov 2014); *C. gaius* Mahunka, 1977 from France; *C. modestus* (Berlese, 1903) from Italy and Crimea (Khaustov 2009); *C. brevipes* Mahunka, 1981 from Hungary; *C. minutus* (Sevastianov, 1981) from Ukraine, Iran and Russia (Khaustov 2014; Loghmani *et al.* 2014); *C. acuminatus* (Sevastianov, 1981) from Ukraine; *C. klepzigii* Khaustov & Moser, 2008 from the USA; *C. pusillus* Khaustov, 2009 from Crimea; and *C. shandizensis* Loghmani & Hajiqanbar, 2014 from Iran (Loghmani *et al.* 2014). Our investigations into heterostigmatine mites associated with insects in Golestan Province (northern Iran)

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during spring and summer 2013 led to the discovery of three new species of the genus *Caesarodispus* phoretic on ants. The aim of this paper is to describe these new species. A key to world species of the genus *Caesarodispus* is also provided.

## MATERIALS AND METHODS

Host alate ants were captured by light trap at three different sites in Golestan Province, northern Iran, during spring and summer 2013. 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 (BX51; Olympus Corporation, Tokyo, Japan). The terminology used in the description follows that of Lindquist (1986). All measurements in the description are given in micrometers ( $\mu\text{m}$ ) for the holotype and (when available) five paratypes (in parentheses). Details of geographical position were recorded using a global positioning system (eTrex 10J; Garmin, Lenexa, KS, USA). Ant hosts were identified by the help of Dr Bernhard Seifert (Department of Entomology, Senckenberg Museum für Naturkunde, Berlin, Germany).

The holotypes of the new species, along with their host ants, are deposited in the Acarological Collection, Department of Entomology, Faculty of Agriculture, Tarbiat Modares University, Tehran, Iran, and (if available) one paratype of each species is deposited in the National Museum of Natural History, Washington, DC, USA.

The following morphological abbreviations are used. C, D, EF, H, opisthosomal segment I, II, III, IV, bearing setae  $c_{1,2}$ ,  $d$ ,  $e$ ,  $f$ ,  $h_{1,2}$ ;  $ia$  and  $ib$ , first and fourth pairs of opisthosomal cupuli;  $sc_2$ , second pairs of scapular setae;  $ch_{1,2}$ , first and second cheliceral setae;  $dGe$ , dorsal genual seta;  $dFe$ , dorsal femoral seta;  $su$ , subcapitular setae;  $ap1-4$ , apodemes I-IV, respectively;  $appo$ , poststernal apodeme;  $appr$ , presternal apodeme;  $apsej$ , sejugal apodeme;  $1a,b$ ,  $2a,b$ ,  $3a-c$ ,  $4a-c$ , setae of coxisternal plates 1-4, respectively;  $ps_{1,3}$ , first and third pseudanal setae;  $tc$ , tectal;  $ft$ , fastigial;  $pv$ , primiventral;  $pl$ , primilateral;  $p$ , proral;  $s$ , subunguinal;  $l$ , lateral;  $v$ , ventral;  $d$ , dorsal;  $\phi_{1,2}$ , first and second tibial solenidion;  $\omega_{1,2}$ , first and second tarsal solenidion;  $u$ , unguinal; prime (') and double-prime (''), anterior and posterior faces of appendage, respectively.

## SYSTEMATICS

### Family Microdispidae Cross, 1965

### Genus *Caesarodispus* Mahunka, 1977

Type species: *Caesarodispus gaius* Mahunka, 1977, by original designation.

*Diagnosis.* See Khaustov (2009, 2014).

### *Caesarodispus khaustovi* Rahiminejad & Hajiqanbar sp. nov.

<http://zoobank.org/NomenclaturalActs/39920A67-E982-425A-B6F1-EA071FE5671B>

(Figs 1-7)

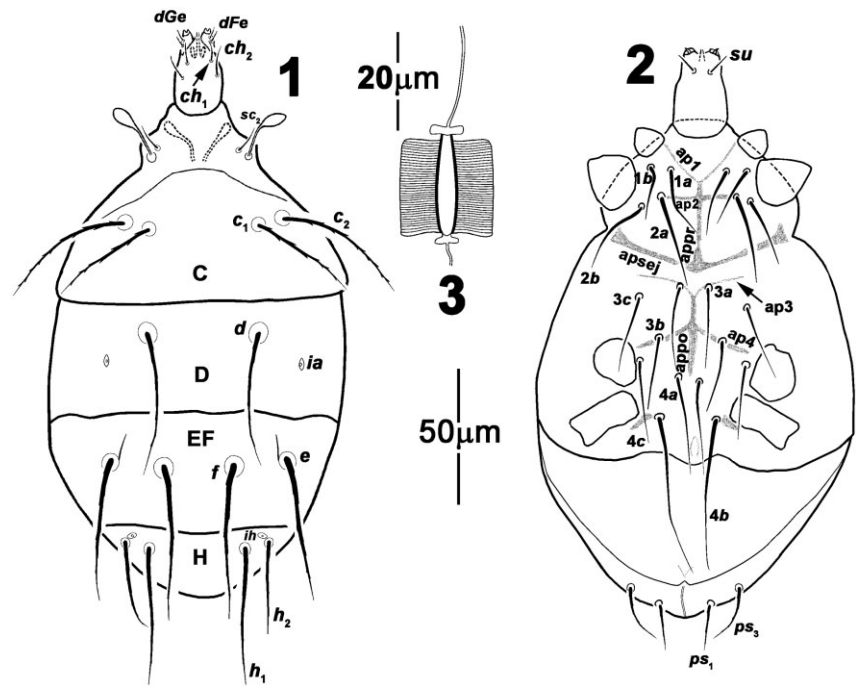
*Diagnosis.* The new species is characterized by having these characters: distance between  $h_1-h_1$  about 2.5 times longer than  $h_1-h_2$ ; seta  $h_1$  (50-52) longer than  $h_2$  (30-33); seta  $e$  associated with apodeme; all dorsal setae extend beyond posterior border of their tergites; cupuli rhombic.

*Female.* Length of idiosoma 200 (193-200), width 110 (110-117).

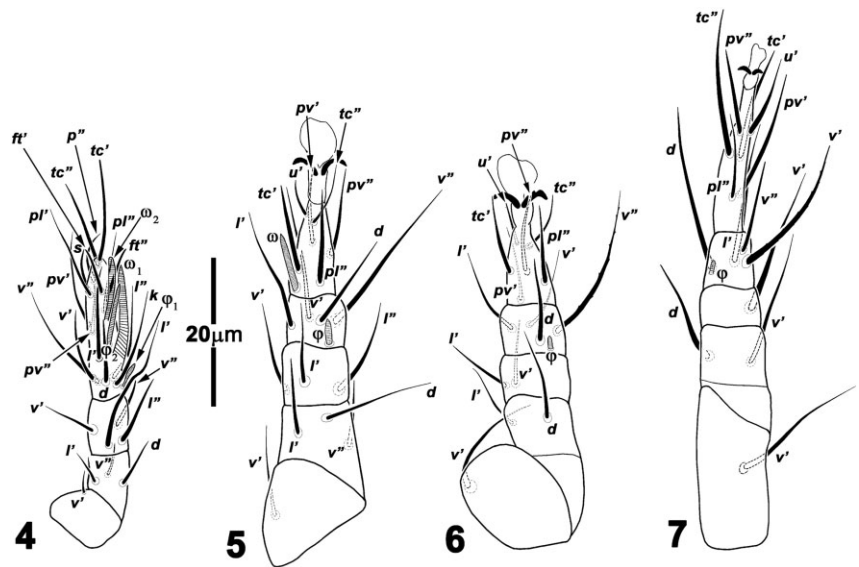
Gnathosoma (Figs 1,2). Gnathosomal capsule elongated, dorsally with two pairs of cheliceral setae  $ch_1$  9 (8-10) and  $ch_2$  9 (9-10); palpi two-segmented, femorogenu with subequal setae  $dFe$  4 (4-4) and  $dGe$  4 (4-4); gnathosoma ventrally with one pair of subcapitular setae  $su$  9 (9-10); pharyngeal system well sclerotized (Fig. 3), including three pumps, pump II developed with transversely striate and pumps I and III vestigial.

Idiosomal dorsum (Fig. 1). Body elliptic, all tergites smooth; stigmata oval and thin peritremes visible; all dorsal setae pointed and barbed except short and smooth  $sc_2$ ; prodorsal shield with stigmata, trichobothria and setae  $sc_2$  25 (22-25); tergite C with two pairs of setae  $c_1$  41 (40-45) and  $c_2$  52 (50-51), setae  $c_2$  longer than  $c_1$ , posterior border of tergite C straight; tergite D with setae  $d$  53 (50-51), cupuli  $ia$  rhombic shape and situated posterior to seta  $d$ ; tergite EF with two pairs of setae  $e$  56 (55-58) and  $f$  59 (57-60), bases of setae  $e$  associated with weakly developed apodemes; tergite H with setae  $h_1$  50 (50-52) and  $h_2$  33 (30-32), cupuli  $ib$  rhombic shape and placed anterior to seta  $h_2$ ; distance  $h_1-h_1$  more than 2.5 times longer than  $h_1-h_2$ ; all dorsal setae extending beyond posterior border of their tergites. Distances between dorsal setae:  $sc_2-sc_2$  32 (31-34),  $c_1-c_1$  42 (41-42),  $c_2-c_2$  60 (56-58),  $c_1-c_2$  12 (11-12),  $d-d$  45 (43-45),  $e-e$  68 (66-71),  $f-f$  27 (26-28),  $e-f$  20 (21-22),  $h_1-h_1$  42 (41-44),  $h_2-h_2$  54 (54-57),  $h_1-h_2$  11 (10-12).

Idiosomal venter (Fig. 2). Apodemes I and III weakly developed, apodemes II joined with presternal apodeme, presternal apodeme not reaching to sejugal apodeme; all ventral plates smooth; all ventral setae smooth; posterior margin of posterior sternal plate with a small protuberance in middle part; apodemes IV long and well developed, reaching beyond bases of setae  $3b$ ;



Figures 1–3 *Caesarodispus khaustovi*, female. 1 Body in dorsal view; 2 body in ventral view; 3 pharyngeal system.



Figures 4–7 *Caesarodispus khaustovi*, female. 4 Leg I; 5 leg II; 6 leg III; 7 leg IV.

apodemes V reduced; posterior margin of aggenital plate rounded; coxal field I with setae *1a* 26 (24–26) and *1b* 20 (19–20); coxal field II with setae *2a* 37 (36–39) and *2b* 27 (24–27); coxal field III with setae *3a* 37 (34–37), *3b* 32 (31–33) and *3c* 32 (32–34); coxal field IV with setae *4a* 40 (39–42), *4b* 55 (54–58) and *4c* 27 (25–28), seta *4b* longest on idiosomal venter; pseudanal plate with setae *ps*<sub>1</sub> 18 (16–20) and *ps*<sub>3</sub> 24 (23–26) indistinctly barbed.

Legs (Figs 4–7): Leg I (Fig. 4). Thinner and shorter than other legs. Setal formula: (number of solenidia in parentheses): Tr1–Fe3–Ge4–TiTa16 (+ $\omega_1$ ,  $\omega_2$ ,  $\phi_1$  and  $\phi_2$ ). Tibiotarsus I without claw, with five blunt-ended eupathidial setae (*p''*, *tc'*, *tc''*, *ft'* and *ft''*), solenidium  $\omega_1$  15 (15) finger shaped, thick and long, solenidium  $\omega_2$  9 (9–10) uniformly thin, solenidium  $\phi_1$  6 (5–6) finger shaped and stemmed,  $\phi_2$  9 (7–9) uniformly thin; genu with seta *l'* longer than others; femur with setae *v''* and *l'* subequal

and shorter than  $d$ ; trochanter with one seta  $v'$  shortest on leg I. Leg II (Fig. 5). Setal formula: Tr1–Fe3–Ge3–Ti4( $\phi$ )–Ta6( $\omega$ ). Tarsus with sickle-like simple claws, solenidion  $\omega$  9 (9–10) finger shaped, seta  $u'$  needle like and shortest on tarsus I; tibia with solenidion  $\phi$  5 (5–6) finger shaped, seta  $v''$  longer than others; genu with three subequal setae; femur with setae  $l'$  and  $v''$  subequal and shorter than  $d$ ; trochanter with seta  $v'$  as long as  $l'$  on femur. Leg III (Fig. 6). Setal formula: Tr1–Fe2–Ge2–Ti4( $\phi$ )–Ta6. Tarsus with seta  $u'$  shortest on leg III; tibia with solenidion  $\phi$  3 (2–3) finger shaped, seta  $v''$  barbed and longest on leg III; genu with two subequal setae  $l'$  and  $v'$ ; femur divided into basifemur and telofemur with seta  $d$  longer than  $l'$ ; trochanter with seta  $v'$  longer than  $l'$  on femur. Leg IV (Fig. 7). Setal formula: Tr1–Fe2–Ge1–Ti4( $\phi$ )–Ta6. Setae  $pv'$  and  $tc''$  subequal and longest on tarsus IV; tibia with solenidion  $\phi$  3 (2–3) finger shaped, seta  $v'$  barbed, seta  $d$  longest on leg IV; genu with only one seta  $v'$  as long as  $v''$  on tibia; femur divided into basifemur and telofemur with seta  $v'$  longer than  $d$ ; trochanter with seta  $v'$  as long as  $v'$  on femur.

*Male and larva.* Unknown.

*Differential diagnosis.* The new species differs from all known species of the genus by the distance between  $h_1$ – $h_1$  which is about 2.5 times longer than  $h_1$ – $h_2$ . In other species of the genus, distances between  $h_1$ – $h_1$  and  $h_1$ – $h_2$  are usually subequal or  $h_1$ – $h_1$  is only slightly longer than  $h_1$ – $h_2$ . The new species is similar to *C. minutus* by the following characters: seta  $v'$  of genu I not thickened, pointed; seta  $d$  no more than 1.5 times longer than  $f$ ; seta  $d$  of tibia IV smooth or weakly barbed, not reaching

beyond tip of pretarsus IV; posterior part of aggenital plate smooth; setae  $f$  distinctly longer than distance  $f$ – $f$ , but differs from it by the aforementioned unique character and that seta  $h_1$  is longer than  $h_2$  (seta  $h_1$  shorter than  $h_2$  in *C. minutus*).

*Type material.* Female holotype (VR-20130706-1) and five paratypes, phoretic on *Tetramorium* sp. The hosts captured by a light trap from three different sites: two specimens (including holotype) from Alangdareh Forest, Gorgan Town, Golestan Province, northern Iran, 36.46°N, 54.26°E, 398 m a.s.l., coll. V.Rahiminejad, 6.vii.2013, along with *C. nodijensis*; two specimens from the hilltop of Hezarpich, Gorgan Town, Golestan Province, northern Iran, 36.49°N, 54.23°E, 310 m a.s.l., coll. V.Rahiminejad, 29.vi.2013 and 17.vii.2013; two specimens from agricultural lands (paddies, peach and citrus orchards) of Nodijeh Village, Golestan Province, northern Iran, 36.49°N, 54.16°E, 28 m a.s.l., coll. V.Rahiminejad, 12.vii.2013.

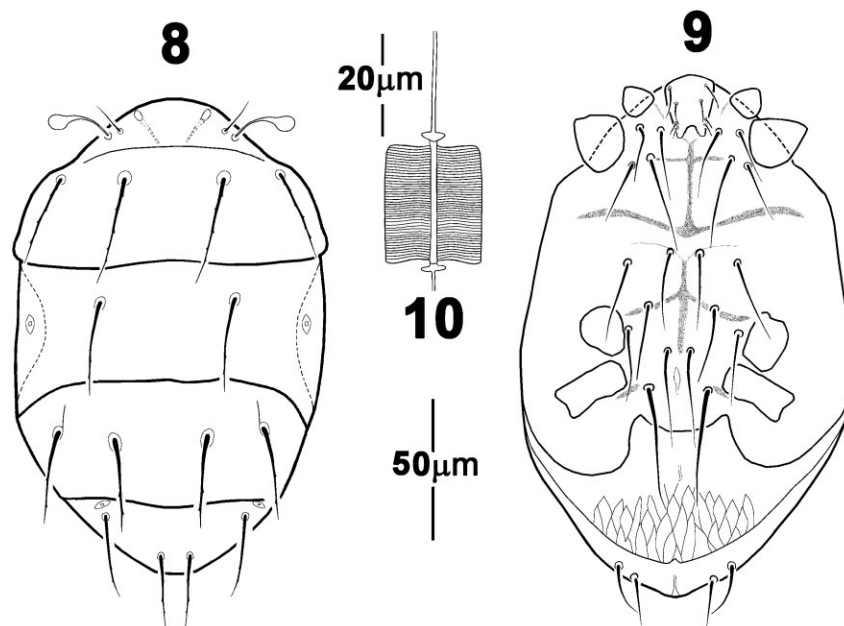
*Etymology.* The new species is named in honor of Dr Alexander Khaustov for his great contribution to the knowledge of heterostigmatine mites.

*Caesarodispus pheidolei* Rahiminejad & Hajiqanbar sp. nov.

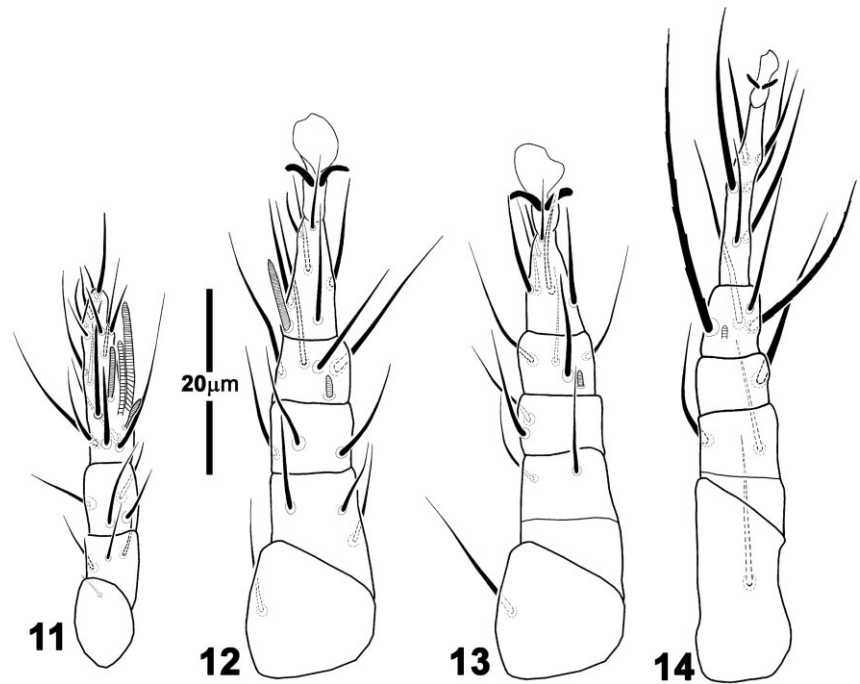
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(Figs 8–14)

*Diagnosis.* The new species is characterized by the following characters: distance between  $h_1$ – $h_2$  about 2.5



Figures 8–10 *Caesarodispus pheidolei*, female. 8 Body in dorsal view; 9 body in ventral view; 10 pharyngeal system.



Figures 11–14 *Caesarodispus pheidolei*, female. 11 Leg I; 12 leg II; 13 leg III; 14 leg IV.

times longer than  $h_1-h_1$ ; solenidion  $\omega_1$  on leg I long, more than two-third length of tibiotarsus; setae  $c_2$  not extending to posterior border of their tergite; setae  $e$  (38) slightly longer than  $f$  (33–34); base of seta  $e$  associated with apodeme; cupuli rhombic.

*Female*. Length of idiosoma 170 (176), width 105 (111).

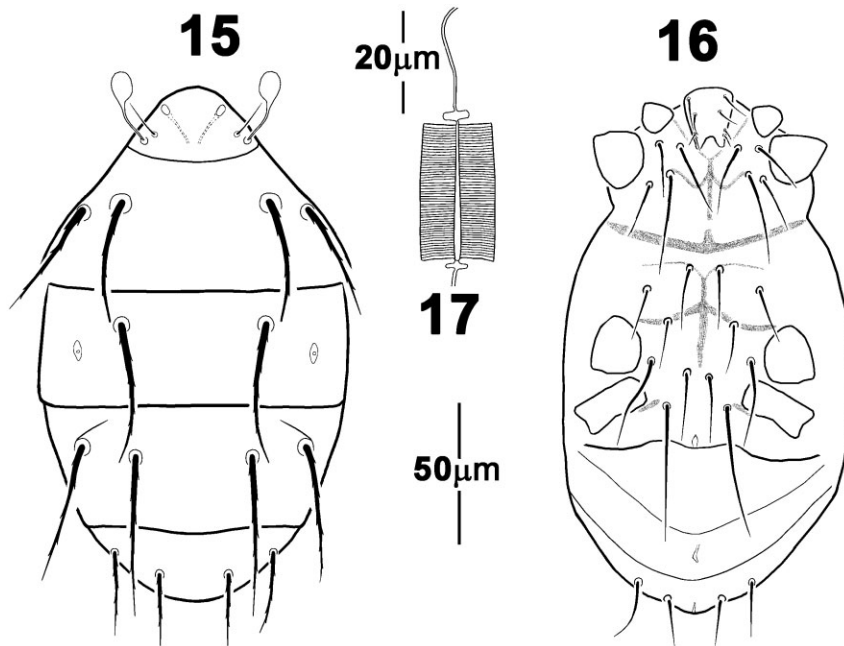
Gnathosoma (Figs 8,9). Gnathosomal capsule dorsally with two pairs of cheliceral setae  $ch_1$  8 (9) and  $ch_2$  8 (9); femorogenua with subequal setae  $dFe$  4 (5) and  $dGe$  4 (5); gnathosoma ventrally with setae  $su$  9 (9); pharyngeal system well sclerotized (Fig. 10), including three pumps, pump II developed with transversely striae and pumps I and III vestigial.

Idiosomal dorsum (Fig. 8). Body oval, all tergites smooth; stigmata oval and with thin peritremes; all dorsal setae pointed and sparsely barbed except short and smooth  $sc_2$ ; prodorsal shield with trichobothria and setae  $sc_2$  15 (18); tergite C with two pairs of setae  $c_1$  55 (56) and  $c_2$  45 (47), seta  $c_1$  longer than  $c_2$  at same level as each other, posterior border of tergite C slightly concave medially; tergite D with setae  $d$  49 (51) extending beyond posterior border of tergite D, cupuli  $ia$  rhombic shape and situated posterior to seta  $d$ ; tergite EF with two pairs of setae  $e$  38 (38) and  $f$  33 (34), bases of setae  $e$  associated with weakly developed apodemes; tergite H with setae  $h_1$  26 (28) and  $h_2$  30 (32), cupuli  $ih$  rhombic shape and placed close to seta  $h_2$ ; distance  $h_1-h_2$  more than 2.5 times longer than  $h_1-h_1$ ; all

dorsal setae extending beyond posterior border of their tergites except seta  $c_2$ . Distances between dorsal setae:  $sc_2-sc_2$  27 (28),  $c_1-c_1$  35 (39),  $c_2-c_2$  77 (58),  $c_1-c_2$  20 (23),  $d-d$  46 (46),  $e-e$  72 (73),  $f-f$  34 (34),  $e-f$  20 (22),  $h_1-h_1$  9 (9),  $h_2-h_2$  48 (50),  $h_1-h_2$  28 (29).

Idiosomal venter (Fig. 9). Apodemes I and III weakly sclerotized, apodemes II joined with presternal apodeme, presternal apodeme reaching to sejugal apodeme; setae of coxal fields I and II indistinctly barbed, other ventral setae smooth; apodemes V vestigial; aggenital plate with distinct longitudinal microsculpture and its posterior margin rounded with undulating projections; coxal field I with setae  $1a$  22 (23) and  $1b$  17 (18); coxal field II with setae  $2a$  35 (37) and  $2b$  21 (25); coxal field III with setae  $3a$  29 (30),  $3b$  28 (30) and  $3c$  29 (30); coxal field IV with setae  $4a$  35 (34),  $4b$  41 (45) and  $4c$  23 (23), seta  $4b$  longest on idiosomal venter; pseudanal plate with setae  $ps_1$  17 (20) and  $ps_3$  21 (23).

Legs (Figs 11–14): Leg I (Fig. 11). Thinner and shorter than other legs. Setal formula: (number of solenidia in parentheses): Tr1–Fe3–Ge4–TiTa16 (+ $\omega_1$ ,  $\omega_2$ ,  $\phi_1$  and  $\phi_2$ ). Tibiotarsus I without claw, with five blunt-ended eupathidial setae ( $p''$ ,  $tc'$ ,  $tc''$ ,  $ft'$  and  $ft''$ ), solenidion  $\omega_1$  16 (17),  $\omega_2$  7 (8),  $\phi_1$  4 (5) and  $\phi_2$  11 (12); genu with seta  $l'$  slightly longer than others; femur with setae  $v''$  and  $l'$  subequal and longer than  $d$ . Leg II (Fig. 12). Solenidion  $\omega$  8 (8); tibia with solenidion  $\phi$  2 (3), seta  $d$  shorter than others; femur with setae  $l'$  and  $v''$



Figures 15–17 *Caesarodispus nodijensis*, female. 15 Body in dorsal view; 16 body in ventral view; 17 pharyngeal system.

subequal and longer than *d*. Leg III (Fig. 13). Tarsus with setae *tc'* and *pv''* subequal; tibia with solenidion  $\phi$  2 (3), seta *v''* simple, seta *l'* longest on leg III; femur with seta *d* as long as *l'*. Leg IV (Fig. 14). Setae *pv''* and *u'* subequal; tibia with solenidion  $\phi$  1 (2), seta *d* barbed, reaching beyond tip of pretarsus IV and more than 1.5 times longer than *v'*; femur with seta *v'* as long as *d*; trochanter with seta *v'* longer than *v'* on femur.

*Male and larva.* Unknown.

*Differential diagnosis.* The new species is most similar to *C. shandizensis* because of the following characters: distance between *h*<sub>1</sub>–*h*<sub>2</sub> about 2.5 times longer than *h*<sub>1</sub>–*h*<sub>1</sub>; solenidion  $\omega$ <sub>1</sub> on leg I long, more than two-thirds length of tibiotarsus. The new species differs from *C. shandizensis* by seta *e* (38) slightly longer than *f* (33–34), base of setae *e* associated with apodeme and seta *d* of tibia IV barbed and reaching beyond tip of pretarsus IV (seta *f* slightly longer than *e*, base of setae *e* without any apodeme and seta *d* of tibia IV smooth and not reaching beyond tip of pretarsus IV in *C. shandizensis*).

*Type material.* Female holotype (VR-20130629-1) and one paratype, phoretic on *Pheidole* sp. The hosts captured by a light trap from the hilltop of Hezarpich, Gorgan Town, Golestan Province, northern Iran, 36.49°N, 54.23°E, 310 m a.s.l., coll. V.Rahiminejad, 29.vi.2013.

*Etymology.* The name of the new species, “*pheidolei*”, is derived from name of its ant host, *Pheidole* sp.

*Caesarodispus nodijensis* Rahiminejad & Hajiqanbar sp. nov.

<http://zoobank.org/NomenclaturalActs/12909C8F-F5D4-42AD-A99F-49558E22554A>

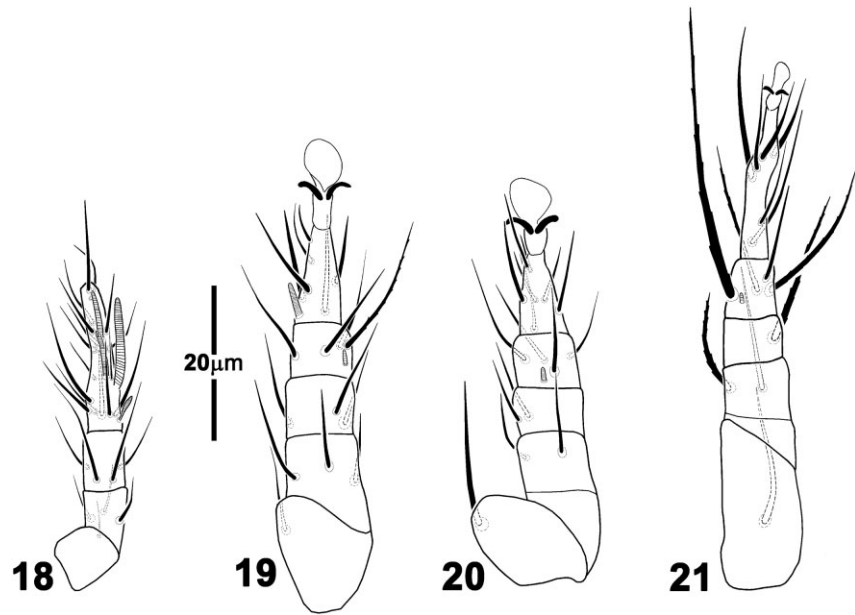
(Figs 15–21)

*Diagnosis.* The new species is characterized by the following characters: distance between *h*<sub>1</sub>–*h*<sub>2</sub> (17–19) and *h*<sub>1</sub>–*h*<sub>1</sub> (17–20) subequal; setae *c*<sub>1</sub> extending to posterior border of their tergite; setae *h*<sub>2</sub> (24–25) longer than *h*<sub>1</sub> (21–22); setae *f* more than two times longer than *h*<sub>1</sub>; setae *f* (49–50) longer than *d* (44–46); base of setae *e* associated with apodeme; cupuli rhombic shape; setae 4*b* two times longer than 4*a*.

*Female.* Length of idiosoma 187 (180), width 79 (78).

Gnathosoma (Figs 15,16). Gnathosomal capsule dorsally with two pairs of cheliceral setae *ch*<sub>1</sub> 6 (5) and *ch*<sub>2</sub> 6 (6), setae *dFe* 3 (3) and *dGe* 3 (3) subequal; setae *su* 7 (7); pharyngeal system well sclerotized (Fig. 17), including three pumps, pump II developed with transverse striae and pumps I and III vestigial.

Idiosomal dorsum (Fig. 15). Body ellipsoid, all tergites smooth; stigmata oval and with thin peritremes; all dorsal setae extending beyond posterior border of their tergites except seta *sc*<sub>2</sub>; prodorsal shield with setae *sc*<sub>2</sub> 17 (15); tergite C with setae *c*<sub>1</sub> 46 (45) and *c*<sub>2</sub> 39 (37), setae *c*<sub>1</sub> longer than *c*<sub>2</sub>; tergite D with setae *d* 46 (44); tergite EF with setae *e* 42 (39) and *f* 50 (49); tergite H with setae *h*<sub>1</sub> 22 (21) and *h*<sub>2</sub> 25 (24), cupuli *ih* absent;



Figures 18–21 *Caesarodispus nodijensis*, female. 18 Leg I; 19 leg II; 20 leg III; 21 leg IV.

distance  $h_1-h_2$  and  $h_1-h_1$  subequal. Distances between dorsal setae:  $sc_2-sc_2$  23 (23),  $c_1-c_1$  44 (43),  $c_2-c_2$  63 (61),  $c_1-c_2$  11 (11),  $d-d$  41 (40),  $e-e$  66 (65),  $f-f$  35 (31),  $e-f$  15 (13),  $h_1-h_1$  20 (17),  $h_2-h_2$  46 (46),  $h_1-h_2$  19 (17).

Idiosomal venter (Fig. 16). Apodemes I and III weakly sclerotized, apodemes II joined with presternal apodeme, presternal apodeme not reaching to sejugal apodeme; setae of coxal fields I and II indistinctly barbed, other ventral setae smooth; coxal field I with setae  $1a$  25 (26) and  $1b$  20 (19); coxal field II with setae  $2a$  33 (33) and  $2b$  20 (24); coxal field III with setae  $3a$  20 (18),  $3b$  18 (18) and  $3c$  18 (18); coxal field IV with setae  $4a$  23 (22),  $4b$  45 (46) and  $4c$  30 (32), seta  $4b$  longest on idiosomal venter; pseudanal plate with setae  $ps_1$  17 (19) and  $ps_3$  19 (21).

Legs (Figs 18–21): Leg I (Fig. 18). Thinner and shorter than other legs. Setal formula: (number of solenidia in parentheses): Tr1–Fe3–Ge4–TiTa16 (+ $\omega_1$ ,  $\omega_2$ ,  $\phi_1$  and  $\phi_2$ ). Tibiotarsus I without claws, with five blunt-ended eupathidial setae ( $p''$ ,  $tc'$ ,  $tc''$ ,  $ft'$  and  $ft''$ ), solenidium  $\omega_1$  12 (12),  $\omega_2$  7 (6),  $\phi_1$  4 (4) and  $\phi_2$  9 (8); genu with setae  $l'$  and  $l''$  subequal and longer than two others; femur with three subequal setae  $v''$ ,  $l'$  and  $d$ . Leg II (Fig. 19). Tarsus with solenidium  $\omega$  3 (4), seta  $pl''$  thick; tibia with solenidium  $\phi$  2 (1), seta  $v''$  barbed and longest on leg II; femur with setae  $d$  and  $v''$  subequal and shorter than  $l'$ ; trochanter with seta  $v'$  shorter than  $l'$  on femur. Leg III (Fig. 20). Tarsus with setae  $tc'$  and  $pv''$  subequal; tibia with solenidium  $\phi$  2 (1), seta  $v''$  simple and shorter than  $d$ ; genu with seta  $l'$  longer than  $v'$ ; trochanter with seta  $v'$  longest on leg III. Leg IV (Fig. 21). Tarsus with setae  $pv''$  and  $u'$

subequal; tibia with solenidium  $\phi$  1 (1), seta  $v'$  and  $v''$  barbed, seta  $d$  extremely long, thick, robust and two times longer than  $v'$ ; genu with seta  $v'$  barbed; femur with seta  $d$  thick, barbed and shorter than  $v'$ ; trochanter with seta  $v'$  as long as  $v'$  on femur.

*Male and larva.* Unknown.

*Differential diagnosis.* The new species is similar to *C. minutus* by the following characters: distance  $h_1-h_2$  and  $h_1-h_1$  subequal; seta  $v'$  of genu I not thickened, pointed; seta  $d$  no more than 1.5 times longer than  $f$ ; posterior part of aggenital plate smooth; setae  $f$  distinctly longer than distance  $f-f$ ; base of setae  $e$  associated with apodeme. The new species differs from *C. minutus* by seta  $d$  of tibia IV heavily barbed and reaching beyond tip of pretarsus IV, setae  $c_1$  longer than  $c_2$ , setae  $h_2$  longer than  $h_1$ , setae  $f$  more than two times longer than  $h_1$ , setae  $f$  longer than  $d$  and setae  $4b$  two times longer than  $4a$  (setae  $c_2$  longer than  $c_1$ , setae  $h_1$  longer than  $h_2$ , setae  $d$  longer than  $f$  and setae  $4b$  less than 1.5 times longer than  $4a$  in *C. minutus*).

*Type material.* Female holotype (VR-20130531-1) and one paratype phoretic on *Tetramorium* sp. The hosts captured by a light trap from Alangdareh Forest, Gorgan Town, Golestan Province, northern Iran, 36.46°N, 54.26°E, 398 m a.s.l., coll. V.Rahiminejad, 31.v.2013. Along with this species, another new species, *C. khaustovi*, was also found.

*Etymology.* The species epithet “*nodijensis*” is derived from name of Nodijeh Village (meaning new stronghold), one of the ancient villages in Golestan Province.

## KEY TO WORLD SPECIES OF THE GENUS *CAESARODISPUS* (FEMALES)

1. Hysterosomal tergites not reticulated; femur II with three setae.....2
  - Hysterosomal tergites distinctly reticulated; femur II with two setae ( $v''$  absent).....*C. samsinaki* (Mahunka)
2. Seta  $v'$  of genu I not thickened, pointed.....3
  - Seta  $v'$  of genu I distinctly thickened, widened distally, strongly barbed.....*C. pusillus* Khaustov
3. Seta  $d$  no more than 1.5 times longer than  $f$  ..... 4
  - Seta  $d$  about four times longer than  $f$ .....*C. klepzigii* Khaustov & Moser
4. Seta  $d$  of tibia IV heavily barbed, reaching beyond tip of pretarsus IV ..... 5
  - Seta  $d$  of tibia IV smooth or weakly barbed, not reaching beyond tip of pretarsus IV .....9
5. Seta  $d$  of femur IV shorter than  $tc''$  of tarsus IV .. 6
  - Seta  $d$  of femur IV subequal to or longer than  $tc''$  of tarsus IV ..... 8
6. Setae  $f$  longer than  $h_1$  ..... 7
  - Setae  $f$  shorter than  $h_1$  ..... *C. gaius* Mahunka
7. Distance  $h_1-h_2$  and  $h_1-h_1$  usually subequal; posterior part of aggenital plate smooth.....*C. nodijensis* Rahiminejad & Hajiqaanbar **sp. nov.**
  - Distance  $h_1-h_2$  about 2.5 times longer than  $h_1-h_1$ ; posterior part of aggenital plate distinctly reticulated.....*C. pheidolei* Rahiminejad & Hajiqaanbar **sp. nov.**
8. Setae  $d$  and  $f$  lanceolate and strongly barbed.....*C. brevipes* Mahunka
  - Setae  $d$  and  $f$  not lanceolate, weakly barbed.....*C. modestus* (Berlese)
9. Posterior part of aggenital plate smooth.....10
  - Posterior part of aggenital plate distinctly reticulated.....*C. shandizensis* Loghmani & Hajiqaanbar
10. Setae  $f$  distinctly longer than distance  $f-f$ .....11
  - Setae  $f$  shorter than distance  $f-f$ .....*C. acuminatus* (Sevastianov)
11. Distance  $h_1-h_2$  clearly about 2.5 times shorter than  $h_1-h_1$ .....*C. khaustovi* Rahiminejad & Hajiqaanbar **sp. nov.**
  - Distance  $h_1-h_2$  and  $h_1-h_1$  subequal .....*C. minutus* (Sevastianov)

## DISCUSSION

There is no comprehensive study on the biology and ecology of *Caesarodispus*. They can be found in ant nests (Khaustov 2014). Khaustov and Moser (2008) found three *C. klepzigii* riding on female alates and seven

*C. klepzigii* on male alates. They did not find any mites on workers. Of our 12 specimens of *Caesarodispus*, ten were associated with female alate ants and two with male alate ants. It seems that phoretic relationships in this genus are influenced by the sex of the hosts.

Until now, six genera of ants had been recorded as hosts of different species of *Caesarodispus* mites (Loghmani *et al.* 2014). The current study revealed another ant genus, *Pheidole*, as a host for *Caesarodispus*. Presently, *Caesarodispus* includes 12 described species that are separated by the aforementioned key.

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