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Article

Redescription of male and female of *Paraneognathus wangae* (Fan & Li) (Acari: Caligonellidae) with a key to all known species of the genus *Paraneognathus*

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Abstract

On the basis of specimens collected from Iran, the characteristics of *Paraneognathus wangae*, which is a new record for the Iranian fauna, are given and a key to all known species of *Paraneognathus* is also provided.

Key words: Raphignathoidea, Caligonellidae, predatory mites, new record, Iran.

Introduction

Family Caligonellidae was erected by Grandjean (1944) based on the genus *Caligonella* Berlese, with *C. humilis* Koch, 1838, as type species. Members of this family are relatively small, free-living predatory mites that feed on small arthropods. They are often found in various habitats such as soil, leaf litter, bark of trees, moss, store houses and bird nests (Summers & Schlinger 1955; Meyer & Ueckermann 1989; Fan 2000; Doğan 2003; Ahaniazad & Bagheri 2012; Akyol & Koç 2012). The peritremal arrangement and configuration on the dorsal surface of the stylophore are used to recognize the genera (Swift 1996; Ueckermann & Khanjani 2003). Fan & Li (1995) erected a new genus *Sinognathus* and described the new species *S. wangae* without knowing that the name had been used for a reptilian before. Then, Fan (2000) provided a new name, *Paraneognathus*, to replace this homonym and suggested that four species of the genus *Neognathus* Willmann, namely *N. afrasiaticus* Soliman, *N. oblongus* Soliman, *N. summersi* Gerson and *N. vulsus* Chaudhri should be transferred to the genus *Paraneognathus*. Noei *et al.* (2008) recorded *P. oblongus* (Soliman, 1971) from rice in Guilan Province. In this study, we redescribe *P. wangae* based on male and female specimens collected from cereals store and rice husk, and also provide a key to all known species of the genus *Paraneognathus.*

Material and Methods

The samples were taken from cereals store and rice husk. Mites were extracted from samples using a Berlese-Tullgren funnel. Collected specimens were cleared in Nesbitt's fluid and mounted in Hoyer's Medium (Walter & Krantz 2009), and examined and drawn with a phase-contrast microscope. The length of idiosoma was measured from

the suture between the gnathosoma and idiosoma to the posterior margin of the idiosoma; the width of idiosoma was measured at the broadest part of the idiosoma and setae were measured from their insertion to their tips. Dorsal setae and leg setal designations follow Kethley (1990). All measurements are given in micrometers (μm).

Results

Genus *Paraneognathus* Fan, 2000: 423
Syn.: *Sinognathus* Fan & Li, 1995: 326

Diagnosis: *Paraneognathus* can be recognized by the following characters: idiosoma without dorsal shields or eyes, bearing 11 pairs of dorsal setae; stylophore elongate, conical, tapered to bifid point anteriorly; peritremes confined to stylophore, ω-shaped, terminal segments of outer arms with sharp curve and inner arms very short; ventral surface striated; genital and anal pores close together and each bearing 3 pairs of setae; genito-anal area with 4 pairs of aggenital setae. Males with genito-anal pores on dorsal side and also with a tongue-like flange on ventral surface of femur III.

Paraneognathus wangae (Fan & Li, 1995)

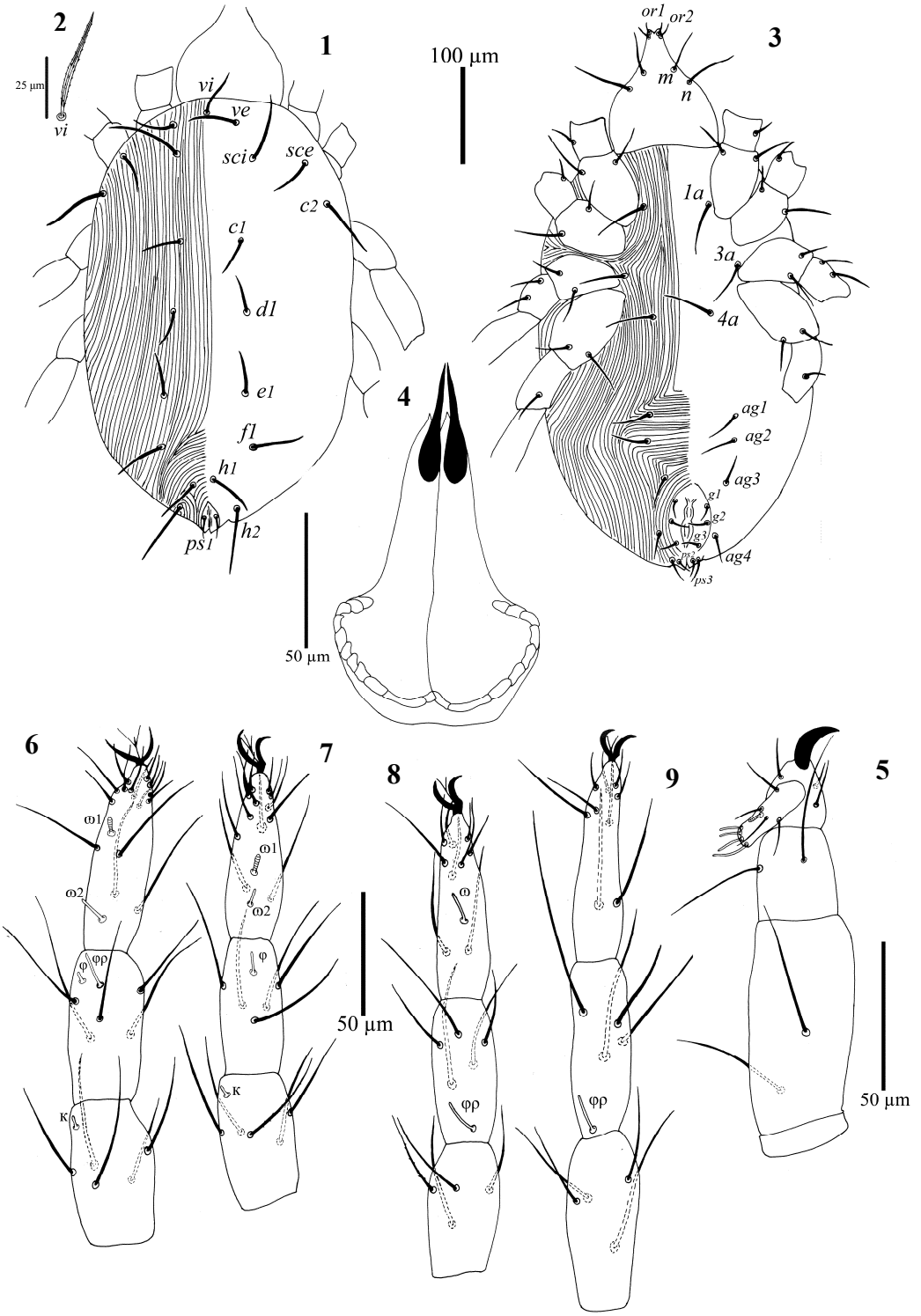
Female (Figs. 1–9). Length of idiosoma 450–490, width of idiosoma 286–300; length of gnathosoma (excluding palp) 130–135; lengths of leg I 414–448, leg II 364–398; leg III 388–410 & leg IV 502–514.

Dorsum (Fig. 1). Dorsum without shields and eyes; integument with simple striae, mostly longitudinal but transverse posteriorly; dorsal body setae barbed (Fig. 2); setae *sci*, c_2 and h_2 longer than other dorsal setae; setal measurements as follows: *vi* 42–46, *ve* 37–40, *sci* 70–78, *sce* 34–48, c_1 29–38, c_2 55–79, d_1 33–37, e_1 40–47, f_1 43–51, h_1 51–52, h_2 65–70. Distances between setae: *vi–vi* 30–40, *ve–ve* 90–120, *sci–sci* 80–94, *vi–ve* 32–45, *sce–sce* 172–200, *sci–ve* 42–45, *sci–sce* 43–64, c_1–c_1 65–82, c_2–c_2 228–244, c_1–c_2 94–104, d_1–d_1 80–102, c_1–d_1 75–86, e_1–e_1 83–100, d_1–e_1 82–95, f_1–f_1 74–84, e_1–f_1 55–72, f_1–h_1 55–70, f_1–h_2 68–85, h_1–h_1 17–22, h_2–h_2 60–70, h_1–h_2 30–35. Anal covers dorsally with 1 pair (ps_1) and ventrally with 2 pairs (ps_2-$_3$) of anal setae.

Venter (Fig. 3). Ventral surface with striae; endopodal shields between coxae absent; setae *1a* and *3a* set on integument; genital valves close to anal pore and with 3 pairs of genital setae (g_1–g_3); 4 pairs of aggenital setae (ag_1–ag_4) on ventral shield present. Length of ventral setae as follows: *1a* 50–60, *3a* 44–52, *4a* 53–60, ag_1 41–55, ag_2 37–47, ag_3 34–42, ag_4 32–40, g_1 21–23, g_2 24–25, g_3 21–22, ps_1 22–26, ps_2 23–26, ps_3 26–30.

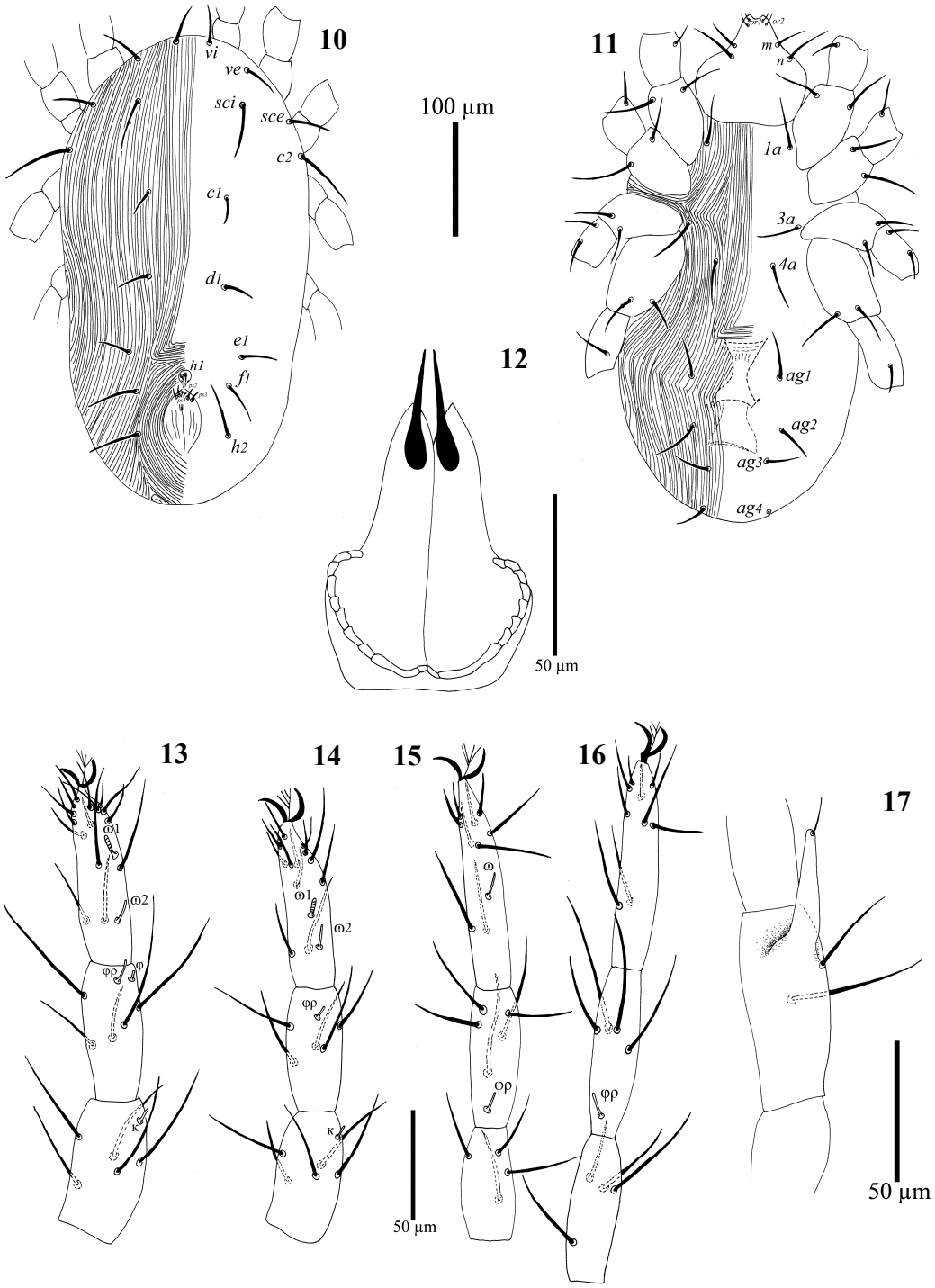
Gnathosoma. Subcapitulum (Fig. 3) with two pairs of adoral setae ($or_{1,2}$), or_1 12–13, or_2 13–15 and also two pairs of subcapitular setae (*m*, *n*), dimension of subcapitulum setae *n* 60–63 and *m* 38–51; distances between *n–n* 57–65, *m–m* 32–35 and *n–m* 24–25; stylophore (Fig. 4) conical; peritremata ω– shaped, with 9–10 segments on each side, 3 terminal segments of outer arms curved sharply; palpus (Fig. 5) with the following complement of setal formulae (femur to tarsus): 2, 2, 3+1 well-developed claw, 4+1ω+4 eupathidia; tibial claw of palpus longer than half length of palptarsus.

Legs (Figs. 6–9). Setae and solenidia (in parentheses) on leg segments as follows: tarsi 15(+2ω)-12(+2ω)-9(+1ω)-9, tibiae 5(+2ω)-5(+1ω)-5(+1ω)- 4(+1ω), genua 5(+1ω)-5(+1ω)-4-4, femora 6-6-3-2, trochanters 1-1-2-1, coxae 2-2-2-2.



Figures 1–9. *Paraneognathus wangae* (female). 1. Dorsal view of idiosoma; 2. Dorsal setae *vi*; 3. Ventral view of idiosoma; 4. Chelicera and Peritreme; 5. Palp; 6. Leg I; 7. Leg II; 8. Leg III; 9. Leg IV.

Male (Figs. 10–17). Length of idiosoma 400, width of idiosoma 221; gnathosoma (excluding palp) 107, (including palp) 174; palp (from base of trochanter to tip of tarsus) 125; Leg I 389; Leg II 360; Leg III 367; Leg IV 453.



Figures 10–17. *Paraneognathus wangae* (male). 10. Dorsal view of idiosoma; 11. Ventral view of idiosoma; 12. Chelicera & Peritreme; 13. Leg I; 14. Leg II; 15. Leg III; 16. Leg IV; 17. Femur III.

Dorsum (Fig. 10). Dorsum without shields and eyes; integument with simple striae, mostly longitudinal but transverse posteriorly; dorsal body setae barbed, setae *sci*, c_2 and h_2 longer than other dorsal setae; setal measurements as follows: *vi* 32, *ve* 40, *sci* 52, *sce* 40, c_1 28, c_2 75, d_1 26, e_1 32, f_1 52, h_1 7, h_2 68. Distances between setae: *vi–vi* 27, *ve–ve* 97, *sci–sci* 90, *vi–ve* 40, *sce–sce* 170, *sci–ve* 56, *sci–sce* 40, c_1–c_1 68, c_2–c_2 220,

c_1–c_2 85, d_1–d_1 70, c_1–d_1 80, e_1–e_1 98, d_1–e_1 65, f_1–f_1 82, e_1–f_1 30, f_1–h_1 42, f_1–h_2 37, h_1–h_1 2, h_2–h_2 75, h_1–h_2 60; genito-anal pore dorsally with three pairs of pseudanal setae (ps_{1-3}): ps_1 5, ps_2 7, ps_3 7.

Venter (Fig. 11). Ventral surface with striae; endopodal shields between coxae absent; setae *1a* and *3a* not set on coxae but on integument; 4 pairs of aggenital setae (ag_1–ag_4) on ventral shield present. Length of ventral setae as follows: *1a* 42, *3a* 46, *4a* 50, ag_1 41, ag_2 45, ag_3 37, ag_4 33.

Gnathosoma. Subcapitulum (Fig. 11) with two pairs of adoral setae ($or_{1,2}$), or_1 12 , or_2 14 and also two pairs of subcapitular setae (*m*, *n*), dimension of subcapitulum setae *n* 45 and *m* 27; distances between *n*–*n* 60, *m*–*m* 35 and *n*–*m* 16; stylophore (Fig. 12) conical; peritremata ω-shaped, with 9–10 segments on each side, 3 terminal segments of outer arms curved sharply; palpus with the following complement of setal formulae (femur to tarsus): 2, 2, 3+1 well-developed claw, 4+1ω+4 eupathidia; tibial claw of palpus longer than half length of palptarsus.

Legs (Figs. 13–17). Setae and solenidia (in parentheses) on leg segments as follows: tarsi 15(+2ω)-12(+2ω)-9(+1ω)-9, tibiae 5(+2ω)-5(+1ω)-5(+1ω)-4(+1ω), genua 5(+1ω)-5(+1ω)-4-4, femora 6-6-3-2, trochanters 1-1-2-1, coxae 2-2-2-2. Femur III with a tongue–like flange (Fig. 17) on ventral surface, bearing a simple seta.

Materials examined

Three females and one male from cereals store, 8 May 2006, Gorgan, Iran, and one females from rice husk, 8 May 2007, Rasht, by Fariba Ardeshir.

Remarks

Our specimens represent all characters of the original description with some variation of which were not considerable.

Key to the species of *Paraneognathus* (female)

1. The peg-like solenidion on tarsus I long and about half as long as the tarsus; tarsus III lacks a solenidion……..……..…….*P. afrasiaticus*
- The peg-like solenidion on tarsus I short; tarsus III with a solenidion……...2
2. Femur I with 7 setae…….……..……..…… *P. vulsus*
- Femur I with 6 setae……...…….……..…..…… 3
3. The peg-like sensory seta of tarsus I longer than that of tarsus II……..... *P. oblongus*
- The peg-like sensory setae of tarsi I and II subequal in length….....4
4. Inclusive counts setae of tarsi I and III 16 and 10, respectively; genu I with 7 setae..... …….……... *P. summersi*
- Inclusive counts setae of tarsi I and III 17 and 11, respectively; genu I with 6 setae..... ……...……..…*P. wangae*

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بازتوصیف کنه‌های نر و ماده *Paraneognathus wangae* (Fan & Li) (Acari: Caligonellidae) همراه با کلیدی برای تمام گونه‌های شناخته شدهٔ جنس *Paraneognathus*

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چکیده

بر اساس نمونه های جمع آوری شده از ایران، مشخصات *Paraneognathus wangae* که نخستین گزارش این گونه از ایران است، به همراه کلیدی برای تمام گونه‌های شناخته شده جنس *Paraneognathus* ارایه شده است.

واژگان کلیدی: Raphignathoidea، Caligonellidae ، کنه‌های شکارگر، گزارش جدید، ایران.

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