



## The first description of male of *Raphignathus arcus* Akyol (Acari: Raphignathidae) and a variation in the number of genital setae of its a female

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**ABSTRACT:** The male of *Raphignathus arcus* Akyol, 2021 is described and illustrated here for the first time. Female and male specimens of *R. arcus* are collected from soil and litter under *Pinus brutia*, *P. pinea* (Pinaceae), *Pistacia terebinthus* (Anacardiaceae) in Manisa, Balıkesir and İzmir provinces, Türkiye. Also, a variation in the number of setae on genital shields of an abnormal female is illustrated in this study.

**Keywords:** Prostigmata, Raphignathoidea, *Raphignathus*, male, variation, Türkiye.

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Raphignathidae is the oldest family in the superfamily Raphignathoidea. They are predatory mites and can be found in different habitats (Zaher and Gomaa, 1979; Meyer and Ueckermann, 1989; Khanjani and Ueckermann, 2003; Fan and Zhang, 2005; Krantz and Walter, 2009). The family consists of 2 valid genera (*Raphignathus* Dugés and *Neoraphignathus* Smiley and Moser). The genus *Raphignathus* is known in all zoogeographic regions, and also they are found all in month of the year. *Raphignathus* has 76 species that are worldwide distribution (Pishavar and Khanjani, 2021; Akyol, 2021; Mohammad-Doustaresharaf and Kazemi, 2022). Up to now 24 species of this genus in Türkiye are known (Doğan, 2007, 2019; Akyol, 2020, 2021).

In this study, male of *Raphignathus arcus* is firstly illustrated and described based on the adult males. Also, an abnormal female's genital region is illustrated.

The specimens were collected from soil and litter under *Pinus brutia*, *P. pinea* (Pinaceae), *Pistacia terebinthus* (Anacardiaceae) in Manisa, Balıkesir and İzmir provinces, Türkiye, and taken to the laboratory in plastic bags and extracted by Berlese-Tullgren funnels for 7 days. Mites were collected in 70% ethanol and mounted on slides in modified Hoyer's medium. The mite specimens were measured and drawn by means of a research microscope (Nikon Eclipse E 400). The setal nomenclature follows those of Kethley (1990) and Grandjean (1944). All measurements (minimum-maximum) were given in micrometres ( $\mu\text{m}$ ). Measurements of legs were taken from base of femur to tips of tarsal claws. Specimens examined were deposited as slide-mounted in Celal Bayar University, Zoological Museum, Manisa, Türkiye (CBZM).

Family **Raphignathidae** Kramer, 1877

Genus **Raphignathus** Dugès, 1834

***Raphignathus arcus* Akyol, 2021**

Description: Male (n=3).

Length of body (including gnathosoma) 182-208, width 83-94.

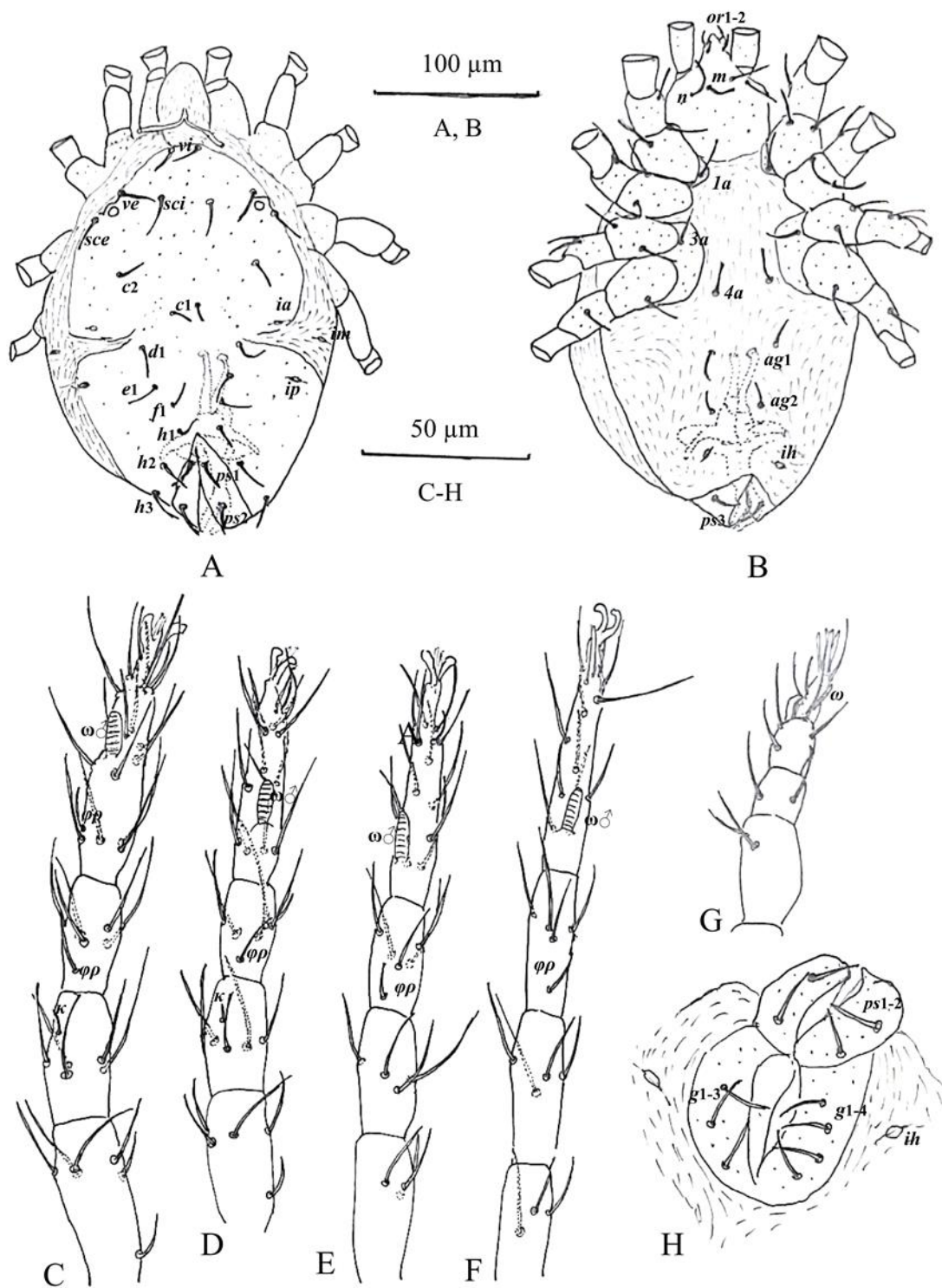
Gnathosoma (Figs 1 A,B,G): Subcapitulum with two pairs of adoral setae (*or1-2*) and two pairs of subcapitular setae  $m = n$  26. Stylophore conical and striated; palp chaetotaxy (femur-tarsus) as follow: 2-2-3+1 claw-4+1 $\omega$ +4 eupathidia.

Dorsum of idiosoma (Fig. 1A): Dorsal body shields fused, striated near lateral margin of body and faintly striated; one pair of eyes located between setae *ve* and *sce*; three pairs of cupuli (*ia*, *im*, *ip*) on idiosoma; dorsal shields sparsely punctuated. Dorsal setae simple. Lengths and distances of dorsal idiosomal setae as follows: *vi* = *ve* = *sci* 21-23, *sce* 23-26, *c1* 16, *c2* 21, *d1* 13-16, *e1* 16-18, *f1* 18-21, *h1* 18-21, *h2* 18-21, *h3* 16-18, *vi-vi* 13-16, *vi-sci* 36-44, *sci-sci* 31-34, *sci-ve* 27-31, *ve-ve* 83-91, *ve-sce* 21, *sce-sce* 114-130, *sce-c1* 75-83, *c1-c1* 10-13, *c1-c2* 44-47, *c2-c2* 88-99, *c2-d1* 49-55, *d1-d1* 62-68, *d1-e1* 18-21, *e1-e1* 49-57, *e1-f1* 18-23, *f1-f1* 34-39, *f1-h1* 16-18, *h1-h1* 23-27, *h1-h2* 26-27, *h2-h2* 52-57, *h2-h3* 23-26, *h3-h3* 68-70.

Venter of idiosoma (Fig. 1B): With two pairs of small and narrow coxisternal shields, one pair between coxa I with setae *1a* 23-27, one pair between coxae III and IV with setae *3a* 23-27; venter striated, with three pairs of setae *4a* 23-26, *ag1* 13-18 and *ag2* 13-16; anal shields with three pairs of pseudanal setae *ps1* = *ps2* 18, *ps3* 16. A pair of cupuli (*ih*) located laterally to genital shields.

Legs (Figs 1C-F): Length of legs: leg I 99-104, leg II 88, leg III 99-104 and leg IV 109-120. Chaetotaxy of leg segments (solenidia in parentheses) as follows: coxae 2-2-2-1, trochanters 1-1-2-1, femora 6-5-3-3, genua 5(+1 $\kappa$ )-5(+1 $\kappa$ )-4-4, tibiae 5(+1 $\phi\rho$ )-5(+1 $\phi\rho$ )-5(+1 $\phi\rho$ )-4(+1 $\phi\rho$ ); tarsi 19(+1 $\omega\sigma$ +1 $\phi\rho$ )-15(+1 $\omega\sigma$ )-13(+1 $\omega\sigma$ )-13(+1 $\omega\sigma$ ).

Immature stages: Unknown.



**Figure 1.** *Raphignathus arcus* Akyol (male): **A.** Dorsal view of idiosoma, **B.** Ventral view of idiosoma, **C.** Leg I, **D.** Leg II, **E.** Leg III, **F.** Leg IV, **G.** Palp, **H.** Abnormal genital setae of female of *R. arcus*.

Materials examined: One female and one abnormal female collected from litter and soil under the *Pistacia terebinthus*, 293 m a.s.l., Yuntdağı mountains, Osmanlı village, Yunusemre district, Manisa province, 6 November 2021; four females and one male from litter and soil under *Pinus brutia*, 224 m a.s.l., Kazdağları mountains, Hasanboğuldu area, Edremit district, Balıkesir province, 25 June 2022; two males from litter and soil under *Pinus pinea*, 506 m a.s.l., Madra mountains, Kozak plateau, Aşağıcumalı village, Bergama district, İzmir province, 26 June 2022 – Türkiye; coll. M. Akyol.

Remarks: *Raphignathus arcus* was firstly described based on adult females from Afyonkarahisar, İzmir and Manisa provinces (the Aegean region of Türkiye), and collected from litter and soil under *Cirsium vulgare* (Asteraceae), *Crataegus monogyna* (Rosaceae), *Hyparrhenia hirta* (Poaceae), *Juniperus oxycedrus* (Cupressaceae), *Olea europaea* (Oleaceae), *Quercus coccifera* (Fagaceae), *Rosa canina* (Rosaceae) and *Verbascum* sp. (Scrophulariaceae) (Akyol, 2021). In this study, the samples under the new plants including *Pinus brutia*, *P. pinea* (Pinaceae), *Pistacia tere-*

*binthus* (Anacardiaceae) were given from Manisa, Balıkesir and İzmir provinces, Türkiye.

The first description of male of *R. arcus* with a variation in the number of genital setae in a female are given. In a female of *Raphignathus arcus*, one side of the genital shields has 4 setae but other side bears 3 setae (Fig. 1H). Species of *Raphignathus* have 3 or 4 pairs of genital setae. Variations in the number of genital setae (4 setae on one side and 3 setae other side, 3 setae on one side and 2 setae other side) were reported in some species of this genus by Gerson (1968), Khanjani and Ueckermann (2003), Koç and Akyol (2004), Doğan (2006), Akyol (2018) and Bingül et al. (2018).

### Statement of ethics approval

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### Conflict of interest

No potential conflict of interest was reported by the author.

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