

A new record for the mite fauna of Turkey: *Molothrognathus shirazicus* (Acari: Caligonellidae) and the first description of its protonymph

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ASBTRACT: *Molothrognathus shirazicus* Khanjani, Bakhshi and Khanjani, 2016 is founded for the first time from Turkey and new report to the mite fauna of Turkey. The female and protonymph specimens of the species are collected from soil and litter under *Pinus brutia*, *P. nigra*, *Olea europaea*, *Paliurus spina-christi*, *Pistacia terebinthus* and *Verbascum* sp., Afyonkarahisar, Manisa, Izmir and Antalya provinces, Turkey. Also, the protonymph stage of *M. shirazicus* is described for the first time in this study. A key to all known species of the genus *Molothrognathus* of Turkey is given.

Keywords: Prostigmata, Raphignathoidea, *Molothrognathus*, new report, Turkey.

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INTRODUCTION

Members of the family Caligonellidae (Acari: Raphignathoidea) are free-living predatory mites that feed on small arthropods and found in various habitats (Khanjani et al., 2016; Akyol, 2018; Amini et al., 2018; Doğan and Doğan, 2020), and with a world-wide distribution (Fan and Zhang, 2005). This family contains 5 genera and 67 species in the world (Doğan and Doğan, 2020). The genus *Molothrognathus* Summers and Schlinger belongs to the family Caligonellidae, so far contains 27 known species in the world, and is represented with 6 species in Turkey, viz. *M. bahariensis* Ueckermann and Khanjani, *M. crucis* Summers and Schlinger, *M. kamili* Doğan, *M. phytocolus* Meyer and Ueckermann, *M. terrulenta* Meyer and Ueckermann and *M. venusta* (Khaustov and Kuznetzov) (Koç and Ayyıldız, 1997; Doğan, 2003, 2019; Akyol and Koç, 2012; Doğan and Doğan, 2020). In this study, a new record of Turkish fauna *Molothrognathus shirazicus* Khanjani, Bakhshi and Khanjani is illustrated and described based on the adult females and protonymph.

MATERIALS AND METHODS

The specimens were collected from soil and litter under *Pinus brutia*, *P. nigra* (Pinaceae), *Olea europaea* (Oleaceae), *Paliurus spina-christi* (Rhamnaceae), *Pistacia terebinthus* (Anacardiaceae) and *Verbascum* sp. (Scrophulariaceae), in Afyonkarahisar, Manisa, Izmir and Antalya provinces, Turkey, 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). The drawn specimen's measurements were given first and followed by range of measurements (minimum-maximum) of other specimens in parentheses. All meas-

urements were given in micrometres (μm). Measurements of legs were taken from base of femur to tips of tarsal claws. The specimens are deposited as slide-mounted in the (CBZM), Manisa, Turkey. See Zhang (2018) for abbreviations.

RESULTS

Family: Caligonellidae Grandjean, 1944

Genus: *Molothrognathus* Summers and Schlinger, 1955

Type species. *Molothrognathus leptostylus* Summers and Schlinger, 1955

Diagnosis. Peritremes originating medially on stylophore, immediately behind the cheliceral stylet bases.

Molothrognathus shirazicus Khanjani, Bakhshi and Khanjani, 2016

Diagnosis. Dorsum with smooth shield between setae *vi* and *d1*; palp-tibia with three setae; setae *sce* longest; tarsi 15(+1 ω)-10(+1 ω)-9-9 (Khanjani et al., 2016).

Female (n= 18) (Figure 1)

Length of body (excluding gnathosoma) 320 (315-325), width 190 (164-190).

Gnathosoma (Figs 1 A,B,G,H). Subcapitulum with two pairs of adoral setae (*or*1-2) and one pair of subcapitular setae *m* 36 (36-42). Stylophore conical. Tibial claw of palp about as long as palp-tarsus. Length of palp 143 (143-156). Number of setae and solenidia from palp-trochanter to palp-tarsus: 0, 1, 1, 3+1 well-developed claw, 3+1 ω +4 eupathidia. Peritremes as depicted in Fig. 1H.

Dorsum of idiosoma (Fig. 1A). Dorsum with striae; 3 pairs of cupules present, *ia* behind posterior eye, *im* laterad of the setae *d* and *ip* laterad of setae *f*; prodorsum with smooth shield and two pair of eyes. All dorsal setae are

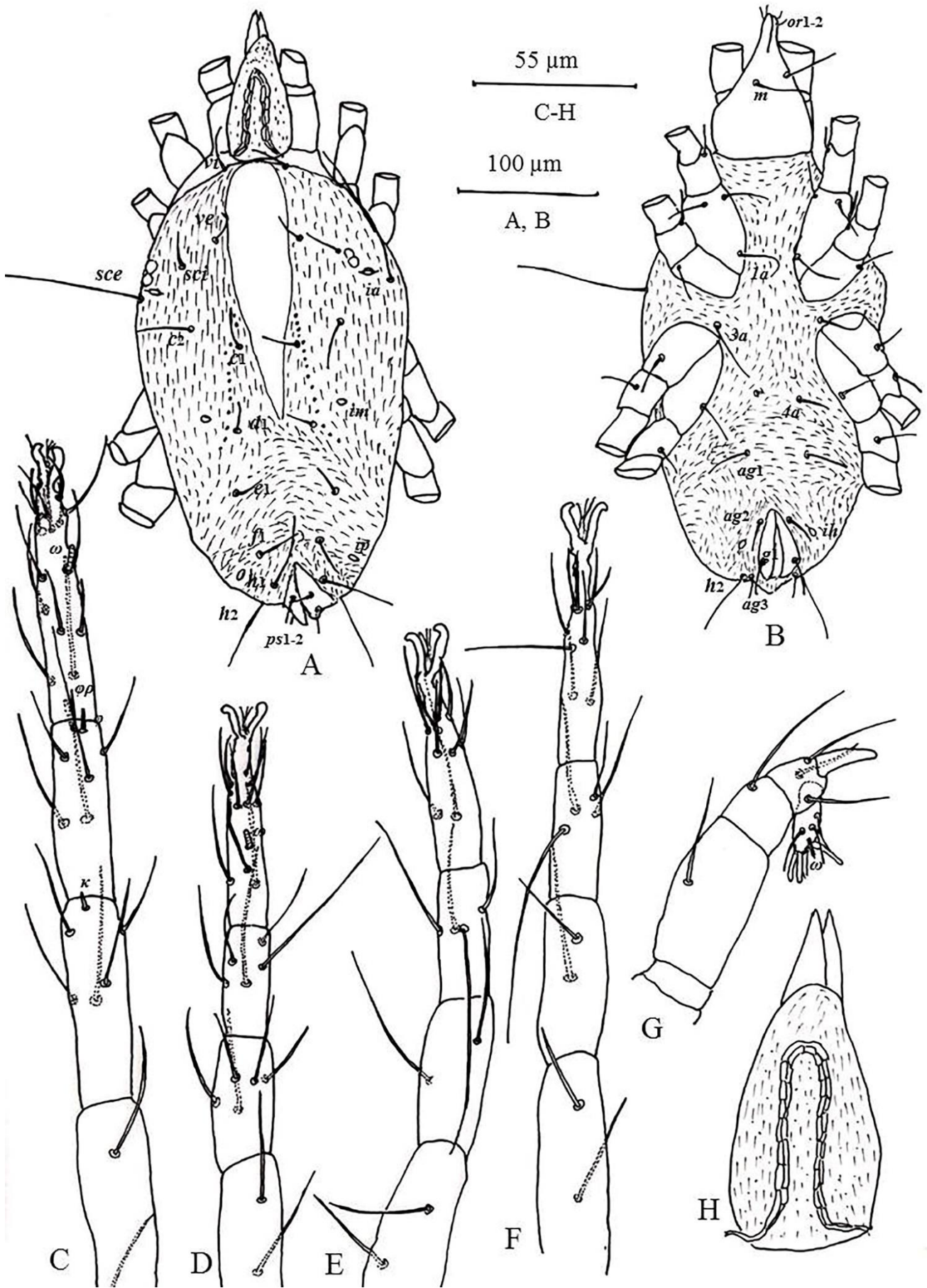


Figure 1. *Molothrognathus shirazicus* Khanjani, Bakhshi and Khanjani (Female) – A. Dorsal view of idiosoma, B. Ventral view of idiosoma, C. Leg I, D. Leg II, E. Leg III, F. Leg IV, G. Palp, H. Stylophore.

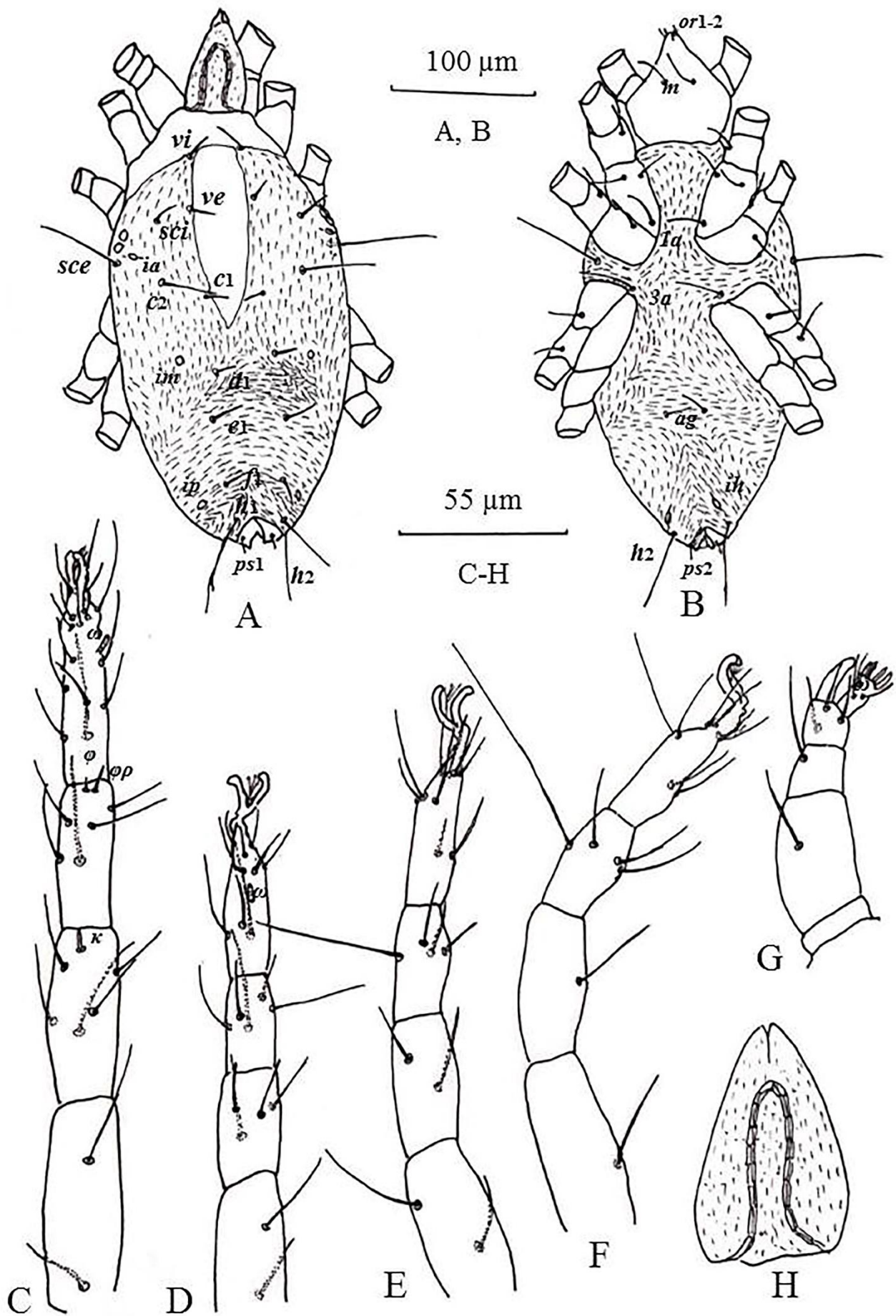


Figure 2. *Molothrognathus shirazicus* Khanjani, Bakhshi and Khanjani (Protonymph) – A. Dorsal view of idiosoma, B. Ventral view of idiosoma, C. Leg I, D. Leg II, E. Leg III, F. Leg IV, G. Palp, H. Stylophore.

simple. Length of dorsal setae: *vi* 26 (21-26), *ve* 21 (18-21), *sci* 21 (21), *sce* 78 (78-91), *c1* 16 (16), *c2* 36 (34-36), *d1* 16 (16), *e1* 32 (18-23), *f1* 26 (26), *h1* 52 (52-55), *h2* 49 (49-52). Distances between dorsal setae: *vi-vi* 44 (39-44), *vi-ve* 47 (47-49), *ve-ve* 55 (52-55), *ve-sci* 26 (26-29), *sci-sci* 107 (104-107), *sci-sce* 34 (31-34), *sce-sce* 151-172, *sce-c1* 70 (62-70), *c2-c2* 104 (96-104), *c1-c1* 36 (34-36), *c1-d1* 52 (52), *d1-d1* 47 (39-47), *d1-e1* 47 (39-47), *e1-e1* 65 (52-65), *e1-f1* 47 (31-47), *f1-f1* 42 (36-42), *f1-h1* 26 (23-26), *h1-h1* 29 (21-29), *h2-h2* 44 (36-44).

Venter of idiosoma (Fig. 1B). Ventral surface striated; endopodal shields absent; ventral setae three pairs: *1a* 36 (31-36), *3a* 42 (39-42) and *4a* 16 (16-18); *1a* located on coxae I, but *3a* and *4a* located on integument; aggenital region with three pairs of setae, *ag1* 21 (21-26), *ag2* 16 (16-18) and *ag3* 8 (8-10); genital valves with one pair of setae *g* 13 (13-16); one pair of cupules (*ih*) located lateral to setae *ag1*. Anal shields posteriorly with two pairs of setae (*ps1-2*).

Legs (Figs 1C-F). Length of legs: I 234 (234-239), II 169 (169-174), III 198 (198-208), IV 216 (216-234). Setal formulae of leg segments I-IV (solenidia not included and in parentheses): coxae 3-1-1-1, trochanters 1-1-1-1, femora 2-2-2-2, genua 5(+1κ)-5-2-2, tibiae 5(+1φ+ 1φρ)-5-4-4, tarsi 15(+1ω)-10(+1ω)-9-9. Lengths of solenidia: Iω 6 (6-8), IIω 5 (5-6), Iφρ 7 (7), Iφ 3 (3-4), Iκ 4 (4).

Protonymph (n= 1) (Figure 2)

Length of body (excluding gnathosoma) 286, width 161.

Gnathosoma (Figs 2 A,B,G,H). Length of palp 112, palp chaetotaxy as in female. Subcapitulum one pair of subcapitular setae (*m* 39). Peritremes as depicted in Fig. 2H.

Dorsum of idiosoma (Fig. 2A). Dorsal setae, cupules, shield area and striae similar to that of adult female. Length of dorsal setae: *vi* 21, *ve* 18, *sci* 21, *sce* 78, *c1* 16, *c2* 36, *d1* 16, *e1* 23, *f1* 26, *h1* 52, *h2* 49. Distances between dorsal setae: *vi-vi* 39, *vi-ve* 31, *ve-ve* 39, *ve-sci* 21, *sci-sci* 96, *sci-sce* 39, *sce-sce* 143, *sce-c1* 65, *c2-c2* 96, *c1-c1* 36, *c1-d1* 42, *d1-d1* 39, *d1-e1* 42, *e1-e1* 52, *e1-f1* 42, *f1-f1* 36, *f1-h1* 26, *h1-h1* 26, *h2-h2* 36.

Venter of idiosoma (Fig. 2B). Ventral surface striated; endopodal shields absent; *1a* 31, *3a* 34; one pair of aggenital setae *ag* 13; setae *4a*, other aggenital setae, genital shields and its setae absent.

Legs (Figs 2 C-F). Length of legs: I 192, II 143, III 161, IV 174. Setal formulae of legs I-IV (solenidia not included and in parentheses): coxae 3-1-1-0, trochanters 1-1-1-0, femora 2-2-2-1, genua 5(+1κ)-4-2-1, tibiae 5(+1φ+ 1φρ)-5-4-4, tarsi 15(+1ω)-10(+1ω)-9-8. Lengths of solenidia: Iω 6, IIω 4, Iφρ 6, Iφ 3, Iκ 4.

Male, deutonymph and larva. Unknown.

Material examined. Twelve females collected from litter and soil under the *Pinus nigra*, 1200 m a.s.l., Emirdağı mountains, B. Karabağ village, Bolvadin district, Afyonkarahisar province, 08 June 2019; one female from litter

and soil under *Verbascum* sp., 130 m a.s.l., Salihli district, 23 June 2019, two females from litter and soil under *Paliurus spina-christi*, and one female from litter and soil under *Olea europaea*, 71 m a.s.l., Muradiye area, Yunussemre district, Manisa province, 27 September and 22 October 2019; two females from litter and soil under *Pistacia terebinthus*, 10 m a.s.l., Patara Beach, Kaş district, Antalya province, 12 July 2019; one protonymph from litter and soil under *Pinus brutia*, 110 m.a.s.l., Gümüldür- Menderes road 7 km, Menderes district, İzmir province, 24 July 2019; Turkey, coll. M. Akyol.

Remarks

Molothrognathus shirazicus Khanjani, Bakhshi and Khanjani, 2016 was described for the first time from Iran and collected from soil under *Populus euphratica* (Salicaceae) and *Platyclusus orientalis* (Cupressaceae), in Shiraz (altitude 1552 m a.s.l.), Fars province, Iran (Khanjani et al., 2016). In this study the samples collected from soil and litter under new host plants including *Pinus brutia*, *P. nigra*, *Olea europaea*, *Paliurus spina-christi*, *Pistacia terebinthus* and *Verbascum* sp. (altitude 10-1200 m a.s.l.) in Afyonkarahisar, Manisa, İzmir and Antalya provinces, Turkey.

Body size of 335 (278) long and 201 (120-136) wide in the Iranian specimens; 320 (315-325) long and 190 (164-190) wide in the Turkish specimens. Body size of the Turkish specimens is almost similar to the Iranian specimens.

The Turkish specimens resemble the Iranian specimens, but some measurements of body setae (*m* 36-42, *4a* 16, *c1* 16, *c2* 34-36, *d1* 16 in the Turkish specimens) are different from the type specimens (*m* 45-50, *4a* 23-28, *c1* 17-21, *c2* 40-51, *d1* 17-21 in the Iranian specimens).

Only female of *M. shirazicus* was found from the type locality (Iran) (Khanjani et al., 2016). This is the second report of this species and a new record for the Turkish fauna. Also, the protonymph stage of *M. shirazicus* is described for the first time in this study.

Key to *Molothrognathus* species of Turkey

1. Dorsal integument with simple striae 2
- Dorsal integument with dual striae *M. kamili* Doğan
2. Prodorsum without shield medially 3
- Prodorsum with shield medially or finely striated spindle shaped shield - like area..... 4
3. Setae *sce* and *c2* much longer than other dorsal setae; tarsi I-IV with 15(+1ω)-10(+1ω)-9-9 setae
..... *M. bahariensis* Ueckermann and Khanjani
- Almost all dorsal setae subequal; tarsi I-IV with 14(+1ω)-9(+1ω)-8-8 setae
..... *M. venusta* (Khaustov and Kuznetsov)
4. Prodorsum with finely striated spindle shaped shield - like area *M. phytocolus* Meyer and Ueckermann
- Prodorsum with shield medially 5
5. Setae *sce* as long as *c2*
..... *M. terrulentus* Meyer and Ueckermann
- Setae *sce* and *c2* not equally long 6

6. Setae *c2* shorter than *sci* and *ve*
.....*M. crucis* Summers and Schlinger
- Setae *c2* longer than *sci* and *ve*
.....*M. shirazicus* Khanjani, Bakhshi and Khanjani

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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