

IRANIAN CALIGONELLIDAE (ACARI: PROSTIGMATA),  
WITH DESCRIPTIONS OF TWO NEW SPECIES AND RE-DESCRIPTION  
OF *MOLOTHROGNATHUS FULGIDUS* SUMMERS AND SCHLINGER,  
WITH A KEY TO GENERA AND SPECIES

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ACARI  
CALIGONELLIDAE  
*MOLOTHROGNATHUS*  
*CALIGONELLA NEOGNATHUS*  
IRAN

**SUMMARY:** Two new species of the family Caligonellidae from Iran are described and illustrated: *Molothrognathus bahariensis* n. sp. and *M. azizi* n. sp. *Molothrognathus fulgidus* (Summers & Schlinger) is re-described. A key to the Iranian genera and species is given.

**RÉSUMÉ :** Deux nouveaux Caligonellidae sont décrits *Molothrognathus bahariensis* n. sp. et *M. azizi* n. sp. *Molothrognathus fulgidus* (Summers & Schlinger) est redécrit et une clé des espèces et genres iraniens est fournie.

GRANDJEAN (1944) erected the family Caligonellidae to accommodate the genus *Caligonella* Berlese on the basis of the peritremes, situated on the stylophore of the gnathosoma. The peritremal arrangement and configuration on the dorsal surface of the stylophore are used to separate the genera (SUMMERS & SCHLINGER, 1955 and SWIFT, 1996). Until now *Molothrognathus mehrnejadi* Liang & Zhang, *M. fulgidus* (Summers & Schlinger), *Caligonella humilis* (Koch) and *Neognathus terrestris* (Summers & Schlinger) were the only representatives of this family recorded from Iran (LIANG & ZHANG, 1997, KHANJANI & KAMALI, 2000). This paper deals with the description of two new species namely *M. azizi* and *M. bahariensis*, and redescription of *M. fulgidus*.

All the measurements are given in micrometer ( $\mu\text{m}$ ). Morphological terminology follows that of (SUMMERS & SCHLINGER (1955) and notations of dorsal setae.

KETHLEY (1990). The notation of the solenidia on leg tibiae follows that of SWIFT, (1996 & 2001). Type material is deposited in the National Collection of Arachnida, Institute of Plant Protection of South Africa, Pretoria.

Family CALIGONELLIDAE Grandjean, 1944  
*Caligonellidae* Grandjean, 1944: 105;  
Wainstein, 1978: 168;  
Chaudhri *et al.*, 1979: 139;  
Kuznetsov & Petrov, 1984: 95;  
Meyer (Smith) & Ueckermann, 1989: 15.  
Type genus: *Caligonella* Berlese, 1910.

These free-living predatory mites can be identified by the following characteristics: inflated bases of stylet chelicerae fused in midline to form a stylophore

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with a pair of dorsal sinuous peritremes which may be looped around its base; idiosoma with no or poorly developed dorsal shields; eyes present or absent; tarsi each with two claws and an empodium, bearing two or more tenent hairs; anus terminal or subdorsal.

KEY TO GENERA AND SPECIES OF IRANIAN CALIGONELLIDAE  
(FEMALES)

- 1 — Peritremes W-shaped and looped on laterobasal margins of stylophore ..... *Neognathus* Willmann  
Peritremes each with 3-4 links; opisthosoma with 3 pairs of cupules ..... *N. terrestris* (Summers & Schlinger)  
Peritremes not like above ..... 2
- 2 — Peritremes arising anteriorly on stylophore .....  
..... *Caligonella* Berlese  
All dorsal setae short and smooth, dorsum without shield-like structures, striae longitudinal on anterior half of dorsum and extend middorsally pass setae *d*; tibia I with solenidion *qp* 3 times longer than *φ* ..... *C. humilis* (Koch)  
Peritremes arising medially on stylophore, .....  
..... *Molothrognathus*, Summers & Schlinger  
..... 3
- 3 — Tarsus I with 16 tactile setae ..... 4  
Tarsus I with 15 tactile setae; setae *sce* (44-60) shorter than *c<sub>2</sub>* (84-92), *f* shorter than *h<sub>1-2</sub>* .....  
..... *M. mehrnejadi* Liang & Zhang
- 4 — Setae *sce* (101-134), *c<sub>2</sub>* (113-142) and *f* (91-123) very long ..... *M. bahariensis* n. sp.  
Only one of these setae or all three much shorter ..... 5
- 5 — Setae *sce* (110-113) and *c<sub>2</sub>* (98-120) very long, setae *f* much shorter (38-44) ..... *M. azizi* n. sp.  
Setae *sce* (38), *c<sub>2</sub>* (54) and *f* (22) much shorter .....  
..... *M. fulgidus* Summers & Schlinger

*Neognathus Willmann*

*Neognathus* Willmann, 1952: 162;  
Summers, 1957: 55; Soliman, 1971:97;  
Chaudhri *et al.*, 1979:141;

Meyer Smith & Ueckermann, 1989: 17.

*Stigmagnathus* Summers & Schlinger, 1955: 546.  
Type-Species: *Neognathus insolitus* Willmann, 1952.

*Neognathus* can be recognized by the following characters: Idiosoma without dorsal shields or eyes; stylophore elongate, conical, tapered to a bifid point anteriorly; peritremes confined to base of stylophore, W-shaped; outer arms may terminate in small lobules

projecting from sidewalls of inflated section of stylophore.

*Neognathus terrestris* (Summers & Schlinger)

*Stigmagnathus terrestris*

Summers & Schlinger, 1955: 547

*Neognathus terrestris* (Summers & Schlinger),

Summers, 1957: 55

This species can be recognized by the following characters: Peritremes with three to four nodes, outer ascending arms terminate on small rounded lobes on lateral margin of stylophore, opisthosoma with three pairs of cupules and setae *m*, located on infracapitulum, twice as far apart as setae *n*. Eyes absent and all dorsal and ventral setae smooth. Tarsus IV without solenidion.

Material Studied-Two females were collected in soil under *Sophora pachycarpa*, Hamadan; 24, Aug., 1992; M. Khanjani

*Caligonella humilis* (Koch)

*Stigmaeus humilis* Koch, 1836

*Caligonella humilis* (Koch), Berlese, (1886): 69

*Caligonella humilis* (Koch), Berlese, 1910: 203;  
Summers & Schlinger, 1955: 542;  
Koc & Ayyildiz, 1996: 67-70

This species can only be distinguished from the closely related *C. afroensis* Meyer & Ueckermann by the shorter peritremes, opisthosomal striae reaching pass setae *d*, and solenidion *qp* on tibia I which are three times longer than *φ*, instead of a third or twice longer than *φ* (95) in *C. afroensis*.

According to Koc & AYYILDIZ (1996) tarsus I has 16 and tibia I six setae, however Turkish specimens sent to me by Dr. Koç do have 15 and five setae on tarsus and tibiae I, respectively, the same as in the Iranian specimens. This also corresponds with the description of GRANDJEAN (1946). In Russian (GILYAROV, 1978), French (GRANDJEAN 1946) and in some Iranian specimens, the lateral loops of the peritremes touch the lateral margins of the stylophore. However, in one Iranian specimen, an American specimen (SUMMERS & SCHLINGER 1955) and Turkish specimens (KOC & AYYILDIZ 1996) these loops do not

touch the lateral margins of the stylophore. As we could not find any additional characters to differentiate between these two groups we wish to suggest that this difference in the lengths of the lateral loops is only an intraspecific variation.

Material Studied-Specimens were collected in soil under the following plants: one female, *Glycyrrhiza glabra* L., Tuiserkan, 20 January 2001, M. Khanjani; two females, *Onobrychis cornuta* (L.), Malayer; 27 July 1992, M. Khanjani.

*Molothrognathus* Summers & Schlinger

*Molothrognathus* Summers & Schlinger, 1955: 543;  
Soliman, 1971: 95;

Meyer Smith & Ueckermann, 1989: 23;  
Swift, 1996: 319; Liang & Zhang, 1997: 19;

Koc & Ayyildiz, 1997: 47

Type species: *Molothrognathus leptostylus*  
Summers & Schlinger

The following character distinguishes *Molothrognathus*: Peritremes originating dorsally on the median portion of the stylophore, immediately behind the stylet bases.

*Molothrognathus mehrnejadi* Liang & Zhang

*Molothrognathus mehrnejadi*  
Liang & Zhang, 1997: 22

The following characters distinguish this species: Prodorsum with a shieldlike area (not visible in all specimens); most dorsal body setae vary in length, between 19-25, setae  $c_2$  84-92,  $sce$  44-60,  $f$  30-34,  $h_1$  50-58 and  $h_2$  46-60 are the longest setae; tarsus IV bears 15 tactile setae. LIANG & ZHANG (1997) gave the setal formula of the tarsi as 15 (1)-9 (1)-9-10, but in the Iranian specimens we have studied it is: 15 (1)-10 (1)-9-9.

Material studied-LIANG & ZHANG (1997) described this species from pistachio collar soil in Rafsanjan. The material this study was based on is: three females from grass, Hamadan (Famenia, Hajiabad), 27 August 1998, M. Khanjani; two females, from *Sophora pachycarpa*, Hamadan, 29 September 1992, M. Khanjani; three females from *Alhagi camelorum*, Famenine, 27 August 1992, A. Samodi; one female

from *Phaseolus vulgaris* L., Hamadan (Ali-Abad), 24 August 1993, M. Khanjani; one female from *Trifolium* sp., Bahar (Hassan-Gheshlagh), 15 September 1992, M. Khanjani; one female from *A. camelorum*, 15 September 1993, M. Khanjani; one female from *A. camelorum*, 27 July 1993, M. Khanjani; one female from *S. pachycarpa*, 29 September, 1992, Khanjani and one protonymph from grass, Hamadan, 31, September 2000, M. Khanjani.

*Molothrognathus bahariensis* n. sp.

(FIGS. 1-6)

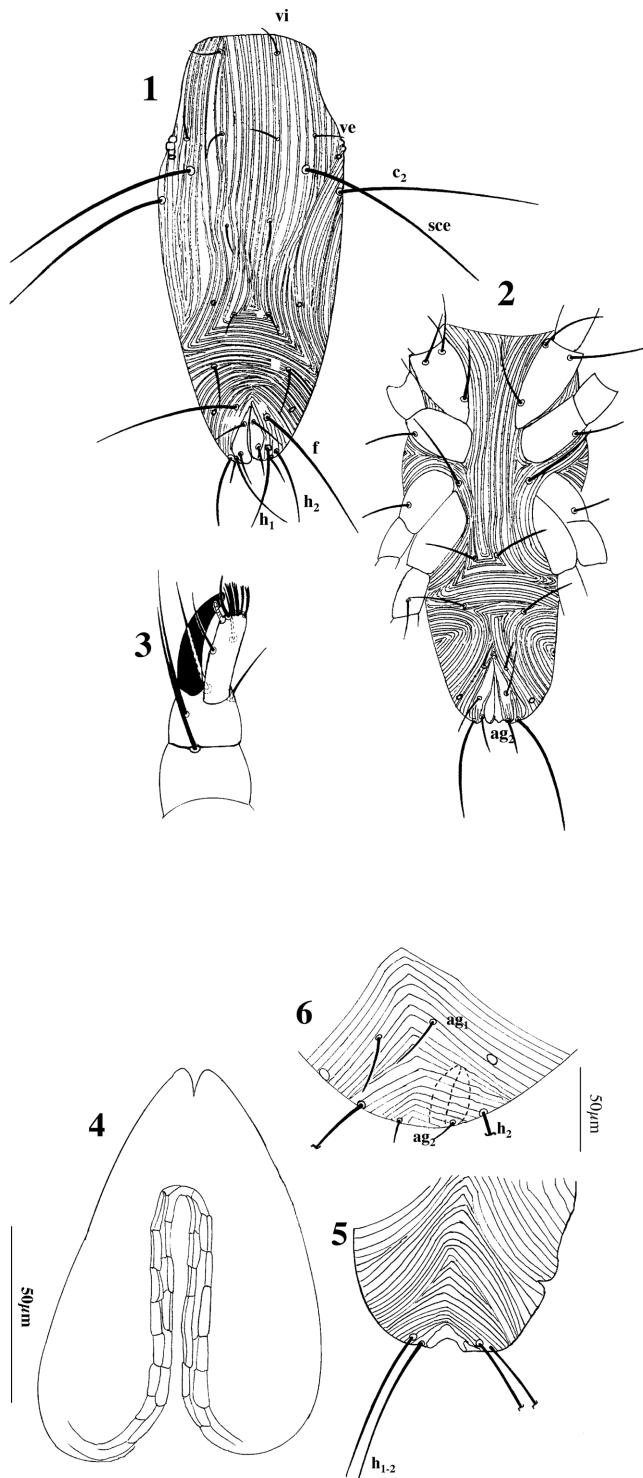
Diagnosis—This new species closely resembles *M. dilucidus* Kuznetsov in having setae  $sce$ ,  $c_2$ ,  $h_1$  and  $h_2$  longer than other dorsal setae. It differs from *M. dilucidus* by the following characters: Seta  $f$  long, extending more than half its length pass posterior margin of opisthosoma, as opposed to reaching only to the posterior margin in *M. dilucidus*, ventral setae longer than those of *M. dilucidus*, prodorsal shield absent but present in *M. dilucidus*.

Female—Dimension of holotype (variations in measurements of paratypes in parentheses): Length of body (including gnathosoma) 416 (346-450), length (excluding gnathosoma) 309 (261-352), width 135 (123-161).

Gnathosoma—Stylophore and peritremes as depicted in figure 4. Palptibial claw slightly longer than tarsus (FIG. 3), number of setae on segments (femur to tarsus): 1-1-3 + 1 claw-7 (1). Palptarsus with a solenidion + three simple setae + four eupathidia.

Dorsum (FIG. 1)—Striae simple and longitudinal up to setae  $d$ , prodorsum without shield. Dorsum with 11 pairs of simple setae and three pairs of cupules one pair anterolateral to setae  $d$ , one pair lateral to setae  $f$  and one pair behind the eyes. Setae  $sce$ ,  $c_2$ ,  $h_1$  and  $h_2$  much longer than other dorsal setae. Length of dorsal setae:  $vi$  28 (19-28),  $ve$  25 (19-28),  $sci$  25 (19-28),  $sce$  139 (101-139),  $c_1$  25 (19-28),  $c_2$  139 (113-142),  $d$  25 (19-25),  $f$  101 (91-123),  $h_1$  69 (50-73),  $h_2$  69 (50-76). Anal opening terminal with two pairs of anal setae ( $ps_{1-2}$ ).

Venter (FIG. 2)—Straight longitudinal striations between coxae becoming transverse posterior to  $4_a$ .



Figs. 1-6: *Molothrognathus bahariensis* n. sp. 1. — Dorsal view of female. 2. — Ventral view of female. 3. — Palp of female. 4. — Stylophore. 5. — Anogenital area of protonymph. 6. — Anogenital area of deutonymph.

Venter with four pairs of setae; two pairs of aggenital setae and one pair of genital setae (*g*). One pair of cupules *ih* between setae *h*<sub>2</sub> and *g*.

Legs — Length of legs I-IV: 347 (284-331), leg II 239 (196-265), leg III 252 (202-277) and leg IV 309 (246-315).

Number of setae on leg segments I-IV: tarsi 16(1)-10(1)-9-9, tibiae 5(2)-5-4-4, genua 5 + 1k-5-2-2, femora 2-2-2-2, trochanters 1-1-1-1, coxae 3-1-1-1.

Male — unknown.

Larva — Length of body including gnathosoma 284, length of body excluding gnathosoma 221, breadth 98, leg I 202, leg II 142 and leg III 183.

Leg IV, genital opening, genital and aggenital setae absent. Leg chaetotaxy: coxae 2-0-0, trochanters 0-0-0, femora 2-2-2, genua 4 + k-4-1, tibiae 5 (2)-5-4, tarsi 15 (1)-9 (1)-8. Most dorsal setae very short (16-22) except for *sce* (79), *c*<sub>2</sub> (85), *f* (79), *h*<sub>1</sub> (54) and *h*<sub>2</sub> (47).

Protonymph (FIG. 5) — Length (including gnathosoma) 284, length (excluding gnathosoma) 221, breadth 98, leg I 233, leg II 164, leg III 186 and leg IV 205.

Smaller than female but with genital opening, genital and aggenital setae absent. The chaetotaxy of the following leg segments also differ from that of female: coxae 3-1-1-1 or 0-0, trochanters 1-1-0-0, femora 2-2-2-1, genua 5 + k-5-2-1, tarsi 16 (1)-10 (1)-9-8. Most dorsal body setae very short and vary between 16 and 22. Setae *sce* (79), *c*<sub>2</sub> (85), *f* (79), *h*<sub>1</sub> (54) and *h*<sub>2</sub> (47) the longest.

Deutonymph (FIG. 6) — Length (including gnathosoma) 296-387, length (excluding gnathosoma) 220-296, breadth 132-135, leg I 271-280, leg II 195-208, leg III 208-217 and leg IV 233-261.

Similar to female but differs in that genital opening and genital setae are absent. Leg chaetotaxy similar to female. Most dorsal body setae vary between 19-22. Setae *sce* (107), *c*<sub>2</sub> (113), *f* (95-101), *h*<sub>1</sub> (57-60) and *h*<sub>2</sub> (50-57) longest.

Type Material — Holotype female and three paratype females collected from clover soil, 53 km from Hamadan to Koltapeh, 14 September 1998, M. Khanjani; one paratype female from *Phaseolus vulgaris* L., 18 August 1993, Malayer (Ali-Abad Damagh), M. Khanjani; two paratype females from *Astragalus* sp., Hamadan (Moslem-Abad), 16 September 1993,

M. Khanjani; one paratype female from *Robinia pseudoacacia* L. 17 October 2001, M. Khanjani; one paratype female from grass, Bahar (Latga), 16 August 1993; one paratype female from grass, 3 September 2001, M. Khanjani; one paratype deutonymph from *Medicago sativa* L., Hamadan (Famenine), 4 September 2000; one paratype protonymph from *Sophora pachycarpa*, Nahavand (Gyan), 30, June 1993, M. Khanjani; one paratype deutonymph from *P. vulgaris*, 26km from Hamadan to Malayer, 16 September 1993, M. Khanjani; one paratype larva from *Alhaghi camelorum* Fisch, Hamadan (Abdorrahim), M. Khanjani; one paratype larva from *A. camelorum*, Hamadan 12 August 1998, A. Sadeghi.

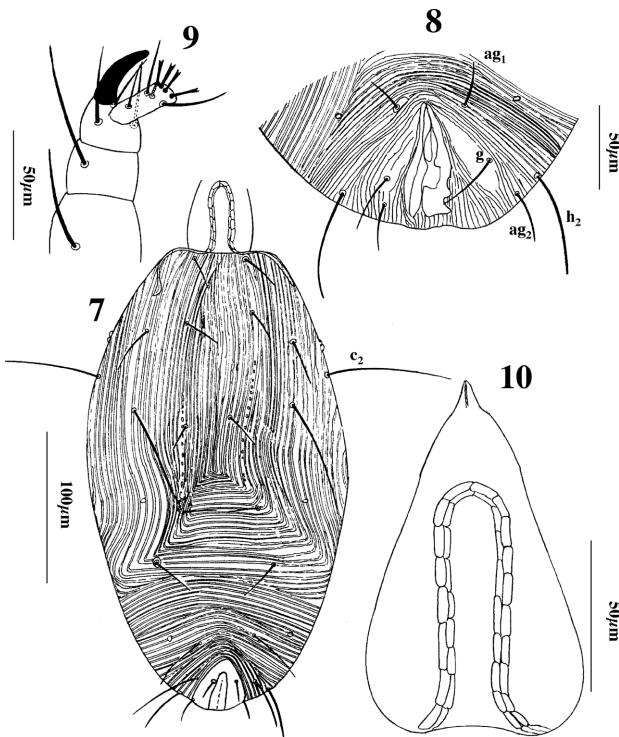
*Molothrognathus azizi* n. sp.  
(FIGS. 7-10)

**Diagnosis:** This species resembles *M. bahariensis* n. sp. and *M. mehrnejadi* Liang & Zhang in general appearance. However it differs from *M. bahariensis* in that tarsus I bears 15 instead of 16 tactile setae, setae *f* much shorter 28-44, as opposed to 91-123 in *M. bahariensis* and in that cupule *ih* is situated postero-lateral to aggenital setae, instead of between setae *g* and *h<sub>3</sub>* as in *M. bahariensis*. It differs from *M. mehrnejadi* in that the prodorsum is without a shieldlike area and setae *sce* (*c<sub>2</sub>*, LIANG & ZHANG, 1997) (101-120) and *c<sub>2</sub>* (*sce*) (98-113) are much longer and subequal in length; 44-60 and 84-92 in *M. mehrnejadi*, respectively.

**Female** — Dimension of holotype (variations in measurements of paratypes in parentheses): Length of body including gnathosoma 406 (403-447); length of body excluding gnathosoma 299 (302-343), width 151 (145-183).

**Gnathosoma** — Stylophore and peritremes as depicted in figure 10. Palptibial claw slightly longer than tarsus (FIG.9). Chaetotaxy of palp (femur to tarsus): 1-1-claw + 3-7 (1). Tarsus with four apical eupathidia forked distally.

**Dorsum** (FIG.7) — Striated with all setae slender and smooth with most setae short except for setae *sce*, *c<sub>2</sub>*, *h<sub>1</sub>* and *h<sub>2</sub>*. Length of setae: *vi* 25 (25-28), *ve* 25 (19-25), *sci* 19 (19-25), *sce* 107 (101-113), *c<sub>1</sub>* 19 (19-



Figs.. 7-10: *Molothrognathus azizi* n. sp. Female. 7. — Dorsal view. 8. — Genital area . 9. — Palp . 10. — Stylophore.

22), *c<sub>2</sub>* 120 (98-120), *d* 19 (19-25), *e* 22 (19-25), *f* 44 (38-44), *h<sub>1</sub>* 69 (63-69) and *h<sub>2</sub>* 50 (44-54).

Dorsum also bears three pairs of cupules, one pair behind eyes, one pair lateral to setae *d* and one pair lateral to setae *f*. Two pairs of eyes present anterior to setae *c<sub>2</sub>*. Anal opening caudodorsal with two pairs of setae on valves.

**Venter** (FIG.8) — Striated with three pairs of very slender setae. Genital valves with only one pair of setae and flanked by two pairs of aggenital setae. One pair of cupules almost lateral to *ag<sub>1</sub>*; between setae *g* and *h<sub>2</sub>* in *M. bahariensis*.

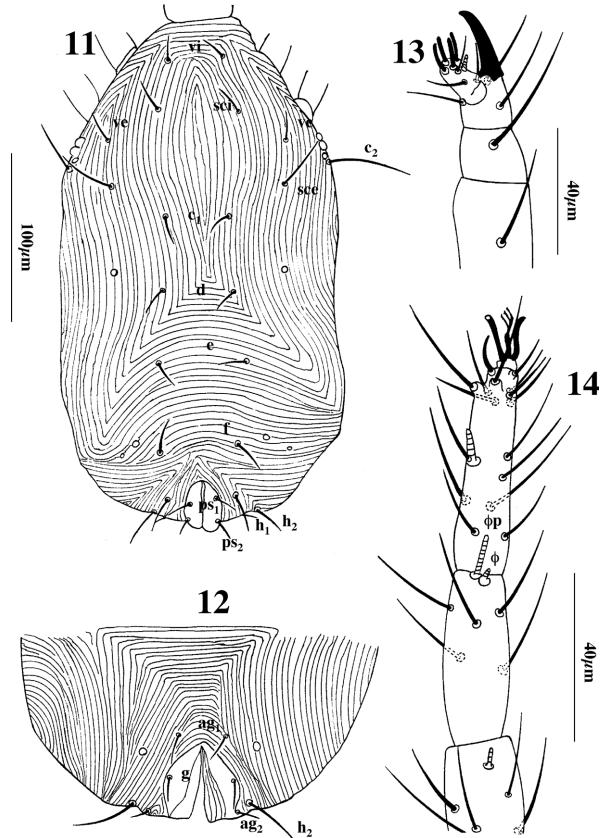
**Legs** — Length of legs: leg I 309 (290-321), leg II 233 (205-233), leg III 252 (217-258) and leg IV 296 (258-302). Chaetotaxy of leg segments: coxae 3-1-1-1, trochanters 1-1-1-1, femora 2-2-2-2, genua 5 + k-5-2-2, tibiae 5 (2)-5-4-4, tarsi 15 (1)-10 (1)-9-9.

**Protonymph** — Dimension: Length (including gnathosoma) 312-365, length (excluding gnathosoma) 243-289, width 110-117, leg I 236-265, leg II 170-198, leg III 189-214 and leg IV 217-152.

Similar to female except for absence of genital opening, genital and aggenital setae. Chaetotaxy of leg segments: coxae 3-1-1-0, trochanters 1-1-1-1, femora 2-2-2-1, genua 5 + k-5-2-1, tarsi 15 (1)-10 (1)-9-8. Most dorsal body setae very short vary between 16-22. Setae *sce* 88-95, *c<sub>2</sub>* 95-101, *f* 25-38, *h<sub>1</sub>* 57, *h<sub>2</sub>* 54-57 are the longest.

Type Material — Holotype female from soil covered with grass, Hamadan (Agh-Tappah), 16 September 2001, A. Azizi, one paratype female same data ; three paratype females from grass, Gorveh, 8 August 1998, A. Azizi; one paratype female from *Medicago sativa* L., Hamadan, 3 September 2001, A. Azizi; one paratype female from *Cicer arietinum* L., Asad-Abad (Chenare-Sheikh), 14 August 1992, M. Khanjani; one paratype female from *Lens sculentum* Moench, Asad-Abad (Hesam-Abad), 11 June 1997, A. Azizi; one paratype female from *Phaseolus vulgaris* L., Malayer (Ali-Abad Damagh), 16 August 1992, M. Khanjani; one paratype female from *Alhagi camelorum* Fisch, 27 July 1993, Malayer, M. Khanjani; two paratype females from *Sophora Pachycarpa*, Asad-Abad (Nader-Abad), 8 August 1998, A. Azizi; one paratype female from *Glycyrrhiza glabra*, Tuiserkan, 21 January 1993, R. Soltani; one paratype female from grass, 26 December 1992, A. Zamznzadeh; one paratype female from grass, Hamadan, 21 August 1993, M. Khanjani; one paratype female from grass, Hamadan, 27 July 1993, M. Khanjani; one paratype female from grass, Bahar (Latga), 22 August 2001, A. Azizi; one paratype protonymph from *Sophora pachycarpa*, Nahavand-Gyane, 30 June 1992, M. Khanjani; one protonymph from *Medicago sativa* L., Hamadan, 17 October 2001, one paratype protonymph from *Sophora pachycarpa*, Malayer (Zamn-Abad), 13 July 1993, M. Khanjani; one paratype protonymph from *Robinia pseudoacacia* L., Hamadan, 17 October 2000, M. Khanjani; one paratype protonymph from *Medicago sativa* L., Hamadan, 18 July 1997, S. Sasani; one paratype protonymph from grass, Hamadan, 22 September 1999, A. Sadeghi.

Etymology — This species is named for Mr. Ali Azizi, collector of some of the specimens and a technician at the Acarology Laboratory of Bu Ali Sina University, Hamadan, Iran.



FIGS. 11-14 *Molothrognathus fulgidus* Summers & Schlinger. Female. 11. — Dorsal view. 12. — Genital area. 13. — Palp. 14. — Leg I.

### *Molothrognathus fulgidus* Summers & Schlinger (FIGS. 11-14)

*Molothrognathus fulgidus*  
Summers & Schlinger, 1955: 544

The Iranian specimens only differ in that the striae on propodosoma forms a slight spindle between setae *sce* and *c<sub>1</sub>*.

We decided to redescribe this species as the description of SUMMERS & SCHLINGER (1955) lacks same details, like leg chaetotaxy and measurements. Female-Dimension: Length including gnathosoma 403, length of body excluding gnathosoma 321 and breadth 176.

Gnathosoma-(FIG.12)-Peritreme, palp and infracapitulum as originally described. Palptibia claw slender and slightly longer than tarsus (FIG. 12).

Chaetotaxy of palp (femur-tarsus): 1-1-claw + 3-7 (1).

Dorsum (FIG.11) — All dorsal setae short except for setae *sce* and *c<sub>2</sub>*. Length of setae *vi*, *ve*, *sci*, *c<sub>1</sub>*, *d* and *e* 19, *sce* 38, *c<sub>2</sub>* 54, *f* and *h<sub>1</sub>* 22 and *h<sub>2</sub>* 28. SUMMERS & SCHLINGER (1955) depicted the striae on the propodosoma as longitudinal between setae *sci* and *c<sub>2</sub>*, but in the Iranian specimen they are slightly spindle-shaped. Three pairs of cupules present on dorsum, one pair behind eyes, one pair lateral to setae *d* and one pair lateral to setae *f*. Anal opening posterodorsally bearing two pairs of anal setae.

Venter (FIG. 12)-Genital area with one pair of genital setae and two pairs of aggenital setae. Cupules *ih* between aggenital and genital setae, closer to aggenital setae.

Legs (FIG. 14) — Length of legs: Leg I 136, leg II 189, leg III 214 and leg IV 246. Two solenidia on tibia one closely associated with  $\varphi$ p about three times longer than  $\varphi$ . Chaetotaxy of leg segments: coxae 3-1-1-1, trochanters 1-1-1-1, femora 2-2-2-2, genua 5 + k-5-2-2, tibiae 5 (2)-5-4-4, tarsi 16 (1)-10 (1)-9-9.

Material Studied — One female collected from soil under *Sophora pachycarpa*, 29 km from Hamadan to Ghorveh, 16 August 1992, M. Khanjani.

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