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Article

A review of the Iranian Parasitidae (Acari: Mesostigmata)

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Abstract

Iranian mites of the family Parasitidae were reviewed in the base of literature and collected materials were reviewed. *Cornigamasus lunaris* Berlese, *Parasitus lunariphilus* Makarova, *P. mustelarum* Oudemans and *Vulgarogamasus kraepelini* (Berlese) are reported for the first time from Iran. The specimens which had been cited previously as *Parasitellus talparum* (Oudemans) were re-examined and identified as *P. fucorum* (De Geer). Also, a key to Iranian genera of the family, distribution and habitats information of the Iranian species are presented.

Key words: Acari, Mesostigmata, Parasitidae, Parasitinae, Pergamasinae, Iran.

Introduction

The cosmopolitan mites of the family Parasitidae are free-living predators feeding on eggs and immature stages of other soil-inhabiting microarthropods and nematodes (Tichomirov 1977; Hyatt 1980; Karg 1993; Blackman 1997). The Parasitidae consist of two subfamilies, the Parasitinae Oudemans, 1901 which commonly inhabit in various temporary substrates, and their deutonymphs often transport to new habitats by phoretic phenomenon associated with insects, and the subfamily Pergamasinae Juvara-Bals, 1972 commonly occur in relatively stable habitats like forest and grassland humus, moss, and soil, and phoretic association are not found in their deutonymphs (Hyatt 1980; Evans 1992; Karg 1993; Lindquist *et al.* 2009).

The family Parasitidae has not generally accepted taxonomic rank. After Berlese (1906), who carried out the first major work on these mites and recognized eight subgenera for the genus *Gamasus* Latreille, 1802, taxonomy of Parasitidae has been improved especially after sixth decade of the last century by recognizing new genera and redefining previously named taxa (e.g. Bhattacharyya 1963; Micherdziński 1966; Holzmann 1969; Karg 1971, 1993; Tichomirov 1977; Athias-Henriot 1971, 1978, 1980;

Juvara-Bals 1972, 1981, 2002; Hennesy & Farrier 1989). Micherdziński (1969) in an extensive review of the family Parasitidae, recognized the genera *Pergamasus* Berlese, *Holoparasitus* Oudemans, *Parasitus* Latreille, *Saprogamasus* Willmann, *Gamasodes* Oudemans, *Poecilochirus* G. & R. Canestrini and *Oocarpais* Berlese, and also divided *Pergamasus*, *Holoparasitus* and *Parasitus* into species groups. Evans & Till (1979) recognized nine genera for the British Parasitinae and five genera for Pergamasinae. Hyatt (1980) revised the Parasitinae from the British Island, reviewed 36 species, including one new species, 14 new records to the British mite fauna, synonymized 11 species and gave five new combinations.

Iranian mites of the family Parasitidae are poorly known. Kamali *et al.* (2001) reported six genera and 16 species of the family in a check list of Iranian mites. So far, 24 species belonging to 11 genera [*Parasitus* Latreille (11 species), *Neogamasus* Tikhomirov (3 species), *Leptogamasus* Trägårdh (2 species), *Vulgarogamasus* Oudemans (1 species), *Pergamasus* Berlese (1 species), *Parasitellus* Willmann (1 species), *Gamasodes* Oudemans (1 species), *Holoparasitus* Oudemans (1 species), *Trachygamasus* Berlese (1 species), *Eugamasus* Berlese (1 species) and *Poecilochirus* G. & R. Canestrini (1 species) have been reported from Iran (Hatami, 1991; Khanjani & Kamali 2000a, b; Kamali *et al.*, 2001; Khezri *et al.* 2006; Pakyari *et al.* 2006; Kheradmand *et al.* 2007; Yahyavinezhad *et al.* 2010; Moradian *et al.* 2011; Rahmani & Zare 2011). The authors cannot confirm all of these identifications and collection data because some of doubtful specimens are unavailable, so new collection data for 13 species, including four new records, are presented which have been examined and data for other species adapted from other authors' papers.

Material and methods

Mites were collected from soil and litter samples or removed from Coleoptera or Diptera. Soil inhabiting mites were extracted by means of a modified Berlese-Tullgren funnel, and those mites associated with insects removed from their hosts under stereomicroscope. Collected mites were cleared in Nesbitt's fluid and finally mounted in Hoyer's medium on microscopic slides.

Morphological observations, measurements and illustrations were made using a compound microscope equipped with differential interference contrast and phase contrast optical systems and a drawing tube. Measurements (in μm) were made from mounted slides. Lengths and widths of podonotal and opisthonotal shields, respectively, were taken from anterior to posterior margins along the midline, and from the lateral margins at the broadest points, and widths of sternal shields from lateral margins at the level of *st2* and their lengths from anterior to posterior margins, and setal length from their base to tip. Idiosomal setal notation follows Hyatt (1980), and for leg setation follows Evans (1963).

The authors only confirm identification of those species reported here as new record for Iran mite fauna and other species were not available for examination. One specimen of each new reported species and from those species with new data is deposited in the Acarological Collection, The Acarological Society of Iran, and the remaining specimens are deposited in the Acarological Collection in Department of Biodiversity, International Center of Science, High Technology & Environmental Sciences (ABICST).

Key to subfamilies and genera identified in Iran

1. Dorsal shield not entire in female, podonotal and opisthonotal shields are separated by a streak, or a schizodorsal shield present; tritosternum of male similar to that of the female; teeth of movable digit of chelicerae in female and deutonymph situated in distal half region; setae *z5* in adults and deutonymph may be different from *j5* and *j6* setae.....….Subfamily **PARASITINAE** Oudemans, 1901…….2
- Dorsal shield of female entire, without lateral incisions; tritosternum of male always biramous with a reduced base which is covered by the genital lamina; 3–4 teeth situated in median part of movable digit of chelicerae in female and deutonymph; all setae of dorsal shield similar in shape and length..... ……..Subfamily **PERGAMASINAE** Juvara-Bals, 1972…….10
2. Setae *al1* and *al2* of palp-genu in deutonymph and adults bifid or divided…….....3
- Setae *al1* and *al2* of palp-genu in deutonymph and adults entire, spatulate or setiform... ……...…….4
3. Movable digit of chelicerae with three teeth in 1/3 of distal region; female endogynium without any teeth or horn-like structures..... ***Eugamasus*** Berlese, 1982
- Movable digit of chelicerae in deutonymph and female with 3–4 teeth in the distal half of digit; female endogynium with large teeth or horn-like structures…… ……..... ***Neogamasus*** Tikhomirov, 1969
4. Opisthogaster hypertrichous, with more than 40 pairs of setae; associated with bumblebees…….....….***Parasitellus*** Willmann, 1939
- Opisthogaster with rarely more than 30 pairs of setae.....5
5. Corniculi in deutonymph and adult long, slender and extending beyond anterior margin of palp-trochanter; salivary styli arising ventero-laterally into grooved corniculi; anterior margin of opisthonotal shield in deutonymph and female clearly concave…….. .....…… ***Cornigamasus*** Evans & Till, 1979
- Corniculi shorter than palp-trochanter; corniculi without grooves, salivary styli arising laterally or dorsolaterally to chelicerae; anterior margin of opisthonotal shield just a little concave or not.....6
6. Setae *al* of palp-femur spatulate or setiform, at the most spiculate distally; length of idiosoma less than 2000µm.....9
- Setae *al* of palp-femur bifid or with one or more distinct processes; length of idiosoma more than 2000µm.....7
7. Setae *z5* in female is similar to *j6*; podonotal and opisthonotal shields of female distinct; male corniculi sunk at the base and hook-form; sternal shield of deutonymph with a transverse dark band between setae *st1-st2*..…….....***Poecilochirus*** G. & R. Canestrini, 1882
- Setae *z5* in female differs from *j6* in length and form, if similar, then female with schizodorsal shield; male corniculi not hooked; sternal shield of deutonymph without transverse dark band between setae *st1-st2*.....8
8. Female with two dorsal shields; metasternal shields fused to sternal shield or separated by a complete or incomplete transverse suture; ambulacra of legs II-IV with lateral conspicuously long pointed pulvillus; leg II of deutonymph without spurs……. ***Trachygamasus*** Berlese, 1904

- Female with two dorsal shields, or a schizodorsal shield is present; suture between metasternal and sternal shields conspicuous and forming an inverted V; ambulacra of legs II-IV with lateral lobes of pulvillus inconspicuous; leg II of deutonymph with spurs……..…… ***Gamasodes*** Oudemans, 1939

9. Dorsal setae, with few exceptions, unequal in shape and length, setae *z5* different from *j5* and *j6*, usually stout and setose; female endogynium often with serrated folded structure; tritosternum of male reduced or closely associated with genital orifice……..……. ***Parasitus*** Latreille, 1795
- Dorsal setae similar in form; tritosternum normal in both sexes; ventrianal shield in adults narrow caudally and anal region often separated by a constriction; female endogynium never serrated; tritosternum normal in both sexes and its base never associated close to genital orifice ……....… ***Vulgarogamasus*** Tikhomirov, 1969

10. Adults holodorsal, peritrematal and opisthogastric shields fused posteriorly; opisthogasteric region with 8–9 pairs of ventral setae; movable digit of female chelicera with three teeth; idiosoma globular and well sclerotized..... ***Holoparasitus*** Oudemans, 1936
- Holodorsal and peritrematal shields fused or separate in female, opisthogastric shield free; all shields fused in male; movable digit of female chelicera with 3–4 teeth; idiosoma usually oval-shaped…….…….……11

11. Female holodorsal and peritrematal shields fused; opisthogastric shield free; dorsal shield of male without transverse suture; podonotal region with 18-22, opisthonotal region hypertrichous and opisthogastric shield with 11-32 pairs of setae; two large and triangular presternal sclerites present in female; epigynium triangular or subpentagonal……..……. ***Pergamasus*** Berlese, 1904
- Female peritrematal shield just united anteriorly with holodorsal shield; peritrematal shields fused to opisthogastric shield; dorsal shield of male with or without transverse suture; podonotal region with 19-20, opisthonotal region with 23-24 and opisthogastric shield with 9-10 pairs of setae; presternal sclerites of female triangular, small, distant from each other or contiguous; palp-genu setae *al1* and *al2* truncate; subgenital sclerites absent…..... ***Leptogamasus*** Trägårdh, 1936

SUBFAMILY PERGAMASINAE

Genus *Holoparasitus* Oudemans, 1936
Type species: *Holoparasitus calcaratus* (C.L. Koch, 1839) [*Gamatus calcaratus* C.L. Koch, 1839]

Holoparasitus minimus (Holzmann, 1969)
(Fig. 1a, b)

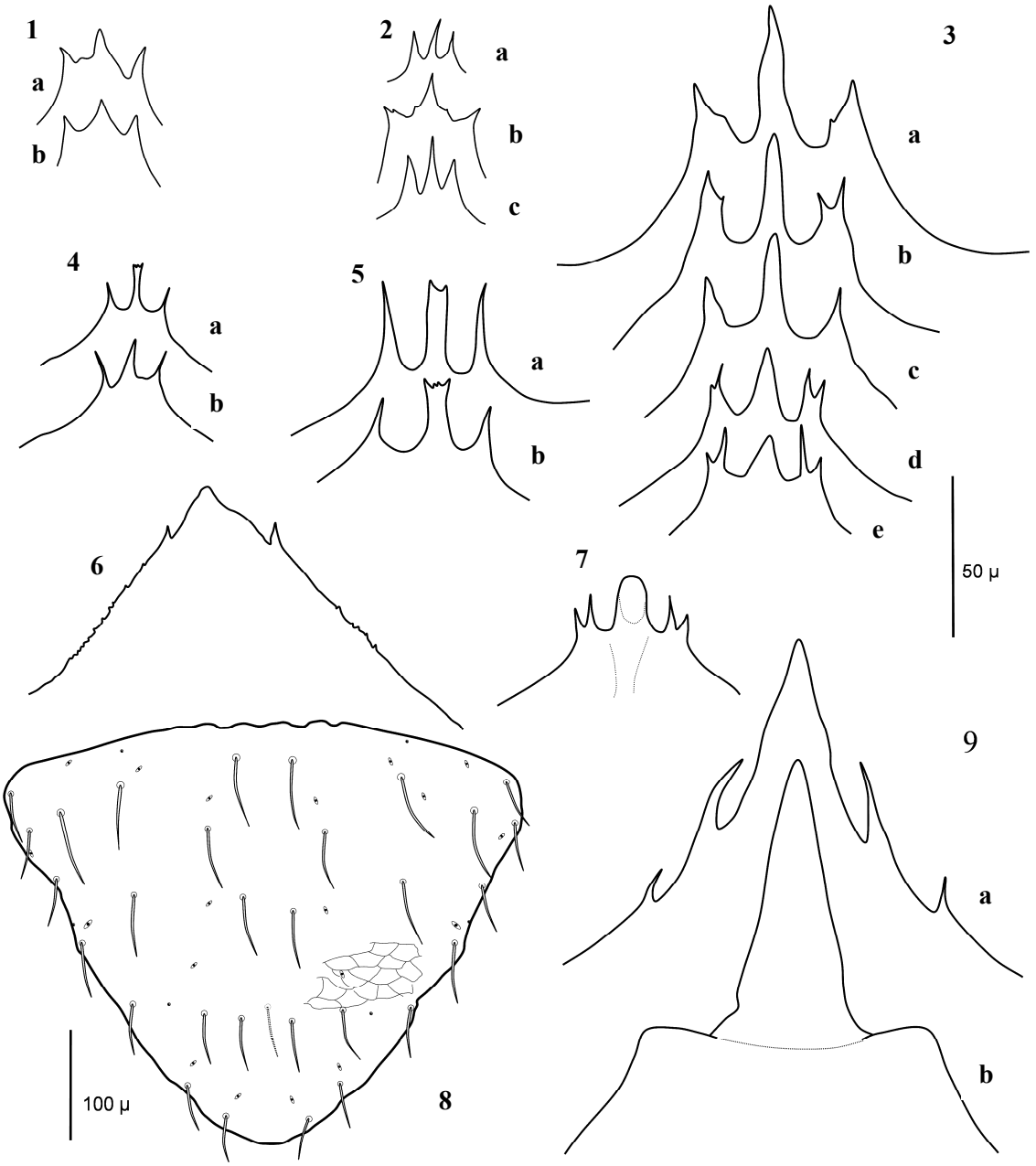
Holoparasitus minimus.— Micherdziński 1969: 377; Tichomirov 1977: 104; Karg 1993: 382.

Occurrence in Iran

Previous data. **Semnan Province**. Livestock manure (Kamali *et al.* 2001).

New data. **Golestan Province** (Gorgan, Gharn Abad Forest). 5 females, rotten wood, 14 June 2011, A. Katuli coll.

Genus *Pergamasus* Berlese, 1904
Type species: *Pergamasus crassipes* (Linnaeus, 1758) [*Acarus crassipes* Linnaeus, 1758]



Figures 1–9. 1 a, b. *Holoparasitus minimus*, variation in female tectum; 2 a-c. *Neogamasus insignis*, variation in female tectum; 3. *Parasitus consanguineus*, a-c. variation in female tectum, d, e. variation in deutonymph tectum; 4. *Parasitus hyalinus*, a. female tectum, b. deutonymph tectum; 5. *Parasitus fimetorum*, a. female tectum, b.

deutonymph tectum; 6. *Parasitellus fucorum*, deutonymph tectum; 7. *Parasitus mycophilus*, deutonymph tectum; 8. *Parasitellus fucorum*, opisthonotal shield of deutonymph; 9. *Parasitus coleoptratorum*, a. deutonymph tectum; b. male tectum.

Pergamasus falculiger (Berlese, 1906)

Occurrence in Iran

Previous data. **Fars Province** (Shiraz). Soil of orchards (Khezri *et al.* 2006).

Genus *Leptogamasus* Trägårdh, 1936
Type species: *Leptogamasus suecicus* Trägårdh, 1936

Leptogamasus bidens Sellnick, 1951

Occurrence in Iran

Previous data. **Tehran Province** (Tehran, Sorkhe-Hesar Park). Soil and litter (Pakyari *et al.* 2006).

Leptogamasus leruthi (Cooreman, 1951)

Occurrence in Iran

Previous data. **Semnan & Tehran Provinces.** Leaf compost, buttonwood and livestock manure (Kamali *et al.* 2001).

SUBFAMILY PARASITINAE

Genus *Parasitellus* Willmann, 1939
Type species: *Parasitellus fucorum* (De Geer, 1778) [*Acarus fucorum* De Geer, 1778]

Parasitellus fucorum (De Geer, 1778)
(Figs. 6 & 8)

Parasitus fucorum.— Micherdziński 1969: 591; Karg 1971: 447.
Parasitus (*Parasitus*) *fucorum.*— Tichomirov 1977: 72.
Parasitellus fucorum.— Evans & Till 1979: 209; Hyatt 1980: 328; Karg 1993: 459.

Diagnosis

Deutonymph. Podonotal shield larger than opisthonotal shield, with 20 pairs of setae, most of setae sparsely pilose, *r3* and *z5* much longer and more pilose than others (*r3/z5*≈ 1.4); opisthonotal shield subtriangular and narrower than podonotal shield, bears usually 15 pairs of homogeneous in length and slightly barbed setae (rarely one unpaired *Jx* seta present, and also may be 1–2 setae of anterolateral area of shield asymmetrically absent) (Fig. 2); sternal shield broad and reticulate, with conspicuously

fine longitudinal striations; anal shield sub-oval, post-anal seta larger and stouter than para-anal setae; tectum is shown in Fig. 3; movable digit of chelicerae with three teeth, fixed digit with four large and two small apical teeth.

Studied materials. Deutonymph. Podonotal shield 490–524 long, 443–481wide, *j1* 96–115, *z4* 118–122, *z5* 195–214, *r3* 274–283; *Z1* 68–70, *J5* 44–46; opisthonotal shield 381–386 long, 376–418 wide, sternal shield 257–290 long, 152–176 wide; para-anal setae19–26; post-anal seta 46–54.

Occurrence in Iran

Previous data. **(Tehran Province).** Associated with *Bumbus* spp. (Yahyavinezhad *et al.* 2010).

New data. **Ardabil Province** (Moeil). 21 deutonymphs, associated with *Bombus argillaceus* (Scopoli), 4 August 2005, A. Monfared coll. (previously reported as *P. talparum* by Kazemi & Kamali 2006); **Mazandaran Province** (Tirtash). Two deutonymphs, associated with *Bombus* sp., July 2007 Sh. Kazemi coll.

Note. A deutonymph specimen of a cleptoparasite species of the *Parasitellus* has been reported before as *P. talparum* (Oudemans, 1913) by Kazemi & Kamali (2006). The studied specimen was re-examined again and the senior author found it is similar to *P. fucorum*, so more slides from preserved mites in Oudemans' fluid were prepared and cleared they belong to the latter species. This species easily could be distinguished from *P. talparum* by 15 pairs of opisthonotal setae (24–30 pairs in *P. talparum*), shape of sternal shield and its surface reticulation which is narrower and without longitudinal striations in *P. talparum*. Also, they differ from each other in shape of tectum, cheliceral teeth and podonotal setae.

Genus *Eugamasus* Berlese, 1982
Type species: *Eugamasus magnus* (Kramer, 1876) [*Gamasus magnus* Kramer, 1876]

Eugamasus covernicola Trägårdh, 1912

Occurrence in Iran

Previous data. **Semnan and Tehran Provinces.** Nest of birds (Kamali *et al.* 2001).

Genus *Neogamasus* Tikhomirov, 1969
Type species: *Neogamasus islandicus* (Sellnick, 1940) [*Parasitus islandicus* Sellnick, 1940]

Neogamasus islandicus (Sellnick, 1940)

Occurrence in Iran

Previous data. **Tehran Province** (Tehran, Sorkhe-Hesar Park). Soil and litter (Pakyari *et al.* 2006).

Neogamasus insignis (Holzmann, 1969)
(Fig. 2)

Parasitus insignis.— Micherdziński 1969: 533; Karg 1971: 448.
Parasitus (*Neogamasus*) *diviortus*.— Tichomirov 1977: 75.
Neogamasus insignis.— Karg 1993: 457.

Occurrence in Iran

Previous data. **Semnan Province.** Livestock manure (Kamali *et al.* 2001); **Tehran Province** (Tehran, Sorkhe-Hesar Park). Soil and litter (Pakyari *et al.* 2006).

New data. **Tehran Province** (Tehran, Laleh Park). Two males, soil and litter, 6 October 2000, Sh. Kazemi coll.; **Guilan Province** (Masuleh). One female, soil, November 2008, unknown coll.; **Mazandaran Province** (Nowshahr, Ecology Garden). Eight females and four deutonymphs, forest litter, N: 40 55, E: 54 57, 11 May 2010, Y. Ahangaran coll.; same locality and collector: two females, 14 September 2010, same locality and collector: four females and one male, 11 May 2010; (Tonekabon, Kol-Lat Forest). Two females, soil and litter, N: 40 64, E: 48 95, 7 June 2010, Y. Ahangaran coll.; (Tonekabon, Tyrom Forest). One female and one deutonymph, N: 40 62, E: 47 11, 7 June 2010, Y. Ahangaran coll.; (Tonekabon, Dimron Forest). Two females, soil and litter, N: 40 62, E: 47 02, 1 May 2010, Y. Ahangaran coll.; (Tonekabon, Konseh Forest). Three deutonymphs, soil and litter, N: 40 62, E: 47 05, 2 May 2010, Y. Ahangaran coll.; (Ramsar, Namak Darreh). One female, soil and litter, 30 September 2010, Y. Ahangaran coll.; (Abbas Abad, Kelar Abad). Three females and one male, sawdust and rotten wood, N: 40 60, E: 52 26, 28 April 2010, Y. Ahangaran coll.; **Golestan Province** (Gorgan, Alang Darreh Forest). Two females, forest litter, 17 July 2011, A. Katuli coll.

Neogamasus cervicornis (van Daele, 1975)

Occurrence in Iran

Previous data. **Fars Province** (Shiraz). Soil of orchards (Khezri *et al.* 2006).

Genus *Poecilochirus* G. & R. Canestrini, 1882
Type species: *Poecilochirus carabi* G. & R. Canestrini, 1882

Poecilochirus necrophori Vitzthum, 1930

Occurrence in Iran

Previous data. **Zanjan Province.** Soil (Rahmani & Zare 2011).

Genus *Parasitus* Latreille, 1795
Type species: *Parasitus coleoptratorum* (Linnaeus, 1758) [*Acarus coleoptratorum* Linnaeus, 1758]

Parasitus americanus Berlese, 1905

Occurrence in Iran

Previous data. **Isfahan Province** (Isfahan). Soil of alfalfa farms (Hatami 1991).

Parasitus mammillatus (Berlese, 1905)

Occurrence in Iran

Previous data. **Fars Province** (Kazerun). Stored onion (Kamali *et al.* 2001); **Hamedan Provimce.** Alfalfa and clover farms (Khanjani & Kamali 2000a); **Kerman Province** (Kerman). Soil (Jalaeian & Ahmadi 2003); **Alborz Province** (Mallard). Nine females, one male, compost (Kheradmand *et al.* 2007).

Parasitus nolli (Karg, 1965)

Occurrence in Iran

Previous data. **Semnan and Tehran Provinces** (Garmsar and Varamin). Livestock and chicken manure, leaf compost, nest of birds, pine (Kamali *et al.* 2001); **Kerman Province.** Soil (Jalaeian and Ahmadi 2003).

Parasitus furcatus (Canestrini, 1882)

Occurrence in Iran

Previous data. **Tehran and Semnan Provinces.** Soil (Kamali *et al.* 2001).

Parasitus concors Oudemans & Voigts, 1904

Occurrence in Iran

Previous data. **Tehran and Semnan Provinces.** Livestock manure (Kamali *et al.* 2001).

Parasitus congener Oudemans & Voigts, 1904

Occurrence in Iran

Previous data. **Tehran and Semnan Provinces.** Livestock manure, carcass of cow (Kamali *et al.* 2001).

Parasitus consanguineus Oudemans & Voigts, 1904
(Figs. 3 a-e)

Parasitus consanguineus.— Micherdziński 1969: 466; Karg 1971: 446; 1993: 468; Hyatt 1980: 263.
Parasitus (*Coleogamasus*) *consanguineus.*— Tichomirov 1977: 88, 91.

Occurrence in Iran

Previous data. **Hamedan Province** (Hamedan). Soil of Fabaceae farms (Khanjani & Kamali 2000a); **Kerman Province.** Soil (Jalaeian & Ahmadi 2003); **West Azerbaijan Province** (Urmia). Soil of potato fields (Mosavi *et al*. 2004); **Tehran Province** (Sorkhe-Hesar Park). Soil and litter (Pakyari *et al*. 2006); **Isfahan Province** (Isfahan). Soil of orchards (Jalaeian *et al*. 2004); **Kordestan Province** (Rijab). Soil (Babakfard *et al*. 2008); **Kerman Province** (Shahrbabak, Maymand). Soil of orchards (Masnavipour *et al*. 2011); **Golestan Province** (Gorgan, Tuskestan Forest). Soil and litter (Kazemi *et al*. 2011).

New data. **Mazandaran Province** (Ramsar, Namak Darreh). Three females, five males and one deutonymph, soil and litter, 29 September 2010, Y. Ahangaran coll.; (Tonekabon, Konseh Forest). One male, soil and litter, N: 40 62, E: 47 05, 19 May 2010, Y. Ahangaran coll.; (Chalous, Roshandarreh). Two males, soil and litter, N: 40 54, E: 53 55, 30 May 2010, Y. Ahangaran coll.; **Tehran Province** (Tehran, Ghalamestan Park). One deutonymph, soil and litter, 3 November 2010, Sh. Kazemi coll.; (Tehran Jamshidiyeh Park). One female and one deutonymph, 27 November 2001, Sh. Kazemi coll.; (Tehran, Shahed University fields). Two deutonymphs, manure, 28 April 2009, F. Hasanzade coll.; (Tehran, Shahed University greenhouses). One deutonymph, cow manure, 15 March 2009, E. Fasihfar coll.; (Roudehen). One deutonymph, soil and litter, 28 April 2008, Mehdipour coll.; **Khorasan Razavi Province** (Mashhad). One deutonymph, ex. *Pentodon* sp., 5 May 2007, H. Hajiqanbar coll.; **Kerman Province** (Kerman, Sirch). Seven deutonymphs, cow manure, 2 February 2012, E. Arjomandi coll.; (Kerman, Sekonj). 12 deutonymphs, sheep manure, 15 March 2012, E. Arjomandi coll.; (Bam, Sekahur). Six deutonymphs, soil, 26 April 2012, N. Mehrzad coll.; **Golestan Province** (Gorgan, Tuskestan Forest). 12 deutonymphs, litter, 15 Oct 2011, A. Katuli coll.

Parasitus hyalinus **(**Willmann, 1949)
(Fig. 4a, b)

Parasitus hyalinus.— Micherdziński 1969: 529; Karg 1971: 447; 1993: 469; Hyatt 1980: 277.
Parasitus (*Vulgarogamasus*) *hyalinus.*— Tichomirov 1977: 80.

Occurrence in Iran

Previous data. **Isfahan Province** (Isfahan). Alfalfa farms (Hatami 1991); **Semnan Province.** Livestock manure (Kamali *et al*. 2001); **Kerman Province.** Soil (Jalaeian & Ahmadi 2003); **Tehran Province** (Tehran, Shahid Beheshti University Campus). Soil (Kamali *et al.* 2004).

New data. **Tehran Province** (Tehran, Ghalamestan Park). One deutonymph, soil and litter, 16 November 2000, Sh. Kazemi coll.; **Kerman Province** (Baft). Six deutonymphs, soil and litter samples, N: 29 88, E: 56 96, 26 May 2012, A. Rajaei coll.; (Sirjan). 12 females, seven deutonymphs, soil of wheat fields, 11 October 2011, M. Masnavipour coll.

Parasitus fimetorum **(**Berlese, 1904)
(Fig. 5a, b)

Parasitus fimetorum.— Micherdziński 1969: 478; Karg 1971: 448; 1993: 470; Hyatt 1980: 271.
Parasitus (*Colegamasus*) *fimetorum.*— Tichomirov 1977: 86, 89.

Occurrence in Iran

Previous data. **Semnan and Tehran Provinces.** Livestock manure, ash, buttonwood, decaying leaf compost, nests of birds, honey bee hives and chicken manure (Kamali *et al.* 2001); **Kerman Province.** Soil (Jalaeian & Ahmadi 2003); (Shahrbabak, Maymand). Soil and litter (Masnavipour *et al*. 2011); **Khuzestan and Mazandaran Provinces.** Honey bee hives (Mosaddegh 1997); **Khuzestan Province** (Ahvaz). Soil (Baharloo *et al*. 2006); **Alborz Province** (Shahryar, Mallard). Compost (Kheradmand *et al.* 2007); **West Azerbaijan Province** (Urmia). Soil (Rezaie *et al*. 2011); **Kohgiluyeh and Boyer-Ahmad Province** (Gachsaran)**.** Soil of corn and rape seed farms (Moradian, *et al*. 2011); **Golestan Province** (Gorgan, Ziarat, Nasr Abad). Deutonymphs ex. *Euonthophagus gibbosus* (Scriba) collected in cattle dung (Bahrami *et al.* 2011).

New data. **East Azerbaijan Province** (Tabriz). One deutonymph, soil and litter, 2 October 1998, S. Safavi coll.; **Tehran Province** (Tehran, Laleh Park). Four females, one male and 16 deutonymphs, soil and litter, 19 October 2001, Sh. Kazemi coll.; (Tehran, Jamshidiyeh Park). One female, 26 November 2001, Sh. Kazemi coll.; (Tehran, Peikanshahr). One deutonymph, soil and litter, 19 December 2006, two deutonymphs, soil and litter, 21 October 2008, Sh. Kazemi coll.; **Fars Province** (Darab). One deutonymph, 15 November 2005, A. Mohammadi Khoramabadi coll.; **Golestan Province** (Gorgan, Shastkola Forest) two deutonymphs, ex. *Euoniticellus pallens* (Olivier) (Scarabaeinae), N: 36 48, E: 54 23, 20 June 2007, Sh. Kazemi coll.; **Mazandaran Province** (Marzan Abad). Two deutonymphs, sawdust and rotten wood, N: 40 35, E: 52 75, 2 June 2010, Y. Ahangaran coll.; (Tonekobon, Dimron). One deutonymph, cow manure, N: 40 62, E: 47 02, 31 May 2010, Y. Ahangaran coll.; (Noshahr, Narenjbon). One deutonymph, soil and rotten wood, N: 40 44, E: 57 79, 7 September 2010, Y. Ahangaran coll.; (Nowshahr, Ecology Garden). One female, N: 40 55, E: 54 57, 19 May 2010, Y. Ahangaran coll.; (Abbas Abad, Kelar Abad). One

deutonymph, sawdust and rotten wood, N: 40 60, E: 52 26, 27 April 2010, Y. Ahangaran coll.

Note. Kamali *et al.* (2001) reported *P. eta* Oudemans & Voigts, 1904, which is junior synonym of *P. fimetorum*, from livestock manure and leaf compost from Semnan and Tehran Provinces (Hyatt 1980).

Parasitus mycophilus (Karg, 1971)
(Fig. 7)
Parasitus mycophilus.— Karg 1971: 444, 450; 1993: 472; Baker & Ostojá-Starzewski 2002:114.

Occurrence in Iran

Previous data. **Hamedan Province** (Hamedan). Fabaceae farms (Khanjani & Kamali 2000b); **Fars Province** (Kazerun). Stored onion (Kamali *et al.* 2001); **Tehran Province.** Livestock manure, rat carcass (Kamali *et al.* 2001); **Kerman Province.** Soil (Jalaeian and Ahmadi 2003).

New data. **Khorasan Razavi Province** (Mashad). One deutonymph ex. *Pentodon* sp., collected in front of a rodent nest, H. Hajiqanbar coll., 4 June 2007; **Kerman Province** (Kerman, Sekonj). Four deutonymphs, cow manure, 2 February 2012, E. Arjomandi coll.; (Kerman, Sekonj). 15 deutonymphs, sheep manure, 15 March 2012, E. Arjomandi coll.

Parasitus coleoptratorum (Linnaeus, 1758)
(Fig. 9a, b)

Parasitus coleoptratorum.— Micherdziński 1969: 393; Karg 1971: 446; 1993: 469, 488; Evans & Till 1979: 210; Hyatt 1980: 256.
Parasitus (*Coleogamasus*) *celer*.— Tichomirov 1977: 85, 89.

Occurrence in Iran

Previous data. **Alborz Province** (Eshtehard & Mehrshahr). Compost and mushrooms (Kheradmand *et al.* 2007); **Golestan Province** (Ziarat). Deutonymphs ex. *E. gibbosus* and *Caccobius schreiberi* (L.) collected in cattle and horse dung, deutonymphs ex. *E. gibbosus* and *Geotrupes* sp. collected in sheep dung, deutonymphs ex. *E. gibbosus* collected in poultry manure from same locality and data (Bahrami *et al.* 2011).

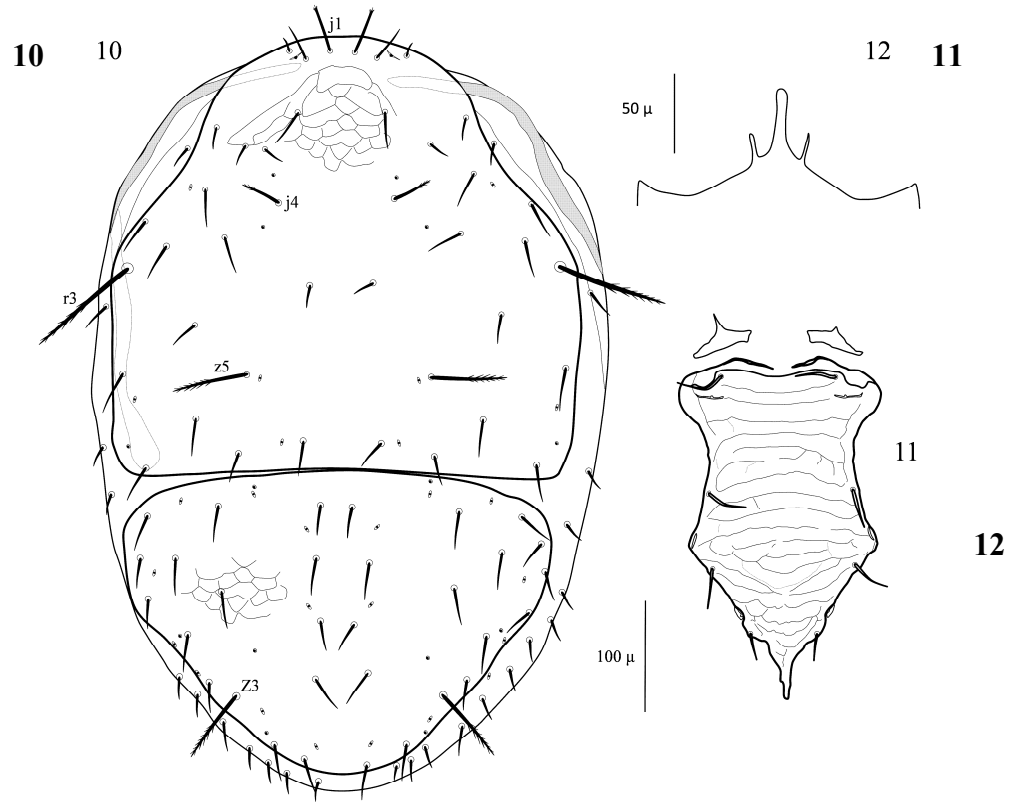
New data. **Golestan Province** (Gorgan, Shastkola Forest). Four deutonymphs, ex. *Polyphilla olivieri* (Laporte), five deutonymphs ex. *Geotrups puncticollis* (Malinowsky) and two deutonymphs ex. *Oxcythyrea cinctella* Schuam, N: 36 48, E: 54 23, 20 July 2007, Sh. Kazemi coll.; three deutonymphs, ex. *E. pallens* collected in cow manure, N: 36 48, E: 54 23, 20 June 2007, Sh. Kazemi coll.; **Mazandaran Province** (Galougah). Two deutonymphs, ex. *Onthophagus* sp. collected in cow manure, N: 36 41, E: 53 50, 9 July 2007, Sh. Kazemi coll.; (Rouyan, Dinkooh). One female and three deutonymphs, soil and litter, N: 40 23, E: 58 03, 4 April 2010, Y. Ahangaran coll.; (Kelardasht, Derazmari). Four deutonymphs, cow manure, N: 40 32, E: 50 40, 13 June 2010, Y.

Ahangaran coll.; (Tonekabon, Dimron). One deutonymph, soil and litter, N: 40 62, E: 47 02, 31 May 2010, Y. Ahangaran coll.; (Kajur, Eslam Abad). One deutonymph, soil, N: 40 25, E: 54 65, 2 June 2010, Y. Ahangaran coll.; (Nowshahr, Khirudkenar). 1 deutonymph, forest litter, N: 40 45, E: 55 45, 15 April 2010, Y. Ahangaran coll.; (Abbas Abad, Kelar Abad). 14 deutonymphs and two males, rotten wood, N: 40 60, E: 52 26, 27 April 2010, Y. Ahangaran coll.

Parasitus mustelarum Oudemans, 1902
(Figs. 10–12)
Parasitus (*Coleogamasus*) *mustelarum*.— Tichomirov 1977: 85, 91.
Parasitus mustelarum.— Micherdziński 1969: 444; Karg 1971: 448; 1998: 472; Hyatt 1980: 288.

Diagnosis
Deutonymph. Dorsal shields well sclerotized and covered most dorsal idiosoma (Fig. 10). Podonotal shield larger than opisthonotal shield, bears 20 pairs of heterogeneous in length setae, usually short and slightly barbed, setae *j1*, *j4*, *z5* and *r3* longer and pilose distally, *r3* longest podonotal setae. Opisthonotal shield normally with 17 (15–17) pairs of relatively short and finely barbed setae, except *Z3* that are more than two times longer than others, stouter and pilose distally. Presternal sclerites almost large; sternal shield with a narrow unsclerotized strip between setae *st1*, and posteriorly attenuated between coxae IV (Fig. 12). Tectum with a long median prong and a pair of usually smooth teeth laterally (Fig. 11).

Studied materials. *Deutonymph.* Podonotal shield 405–440 long, 435–474 wide; opisthonotal shield 288–306 long, 396–428 wide; sternal shield 288–306 long, 126–141 wide.



Figures 10–12. *Parasitus mustelarum*, deutonymph. 10. Dorsal idiosoma; 11. Tectum; 12. Sternal shield and presternal sclerites.

Occurrence in Iran

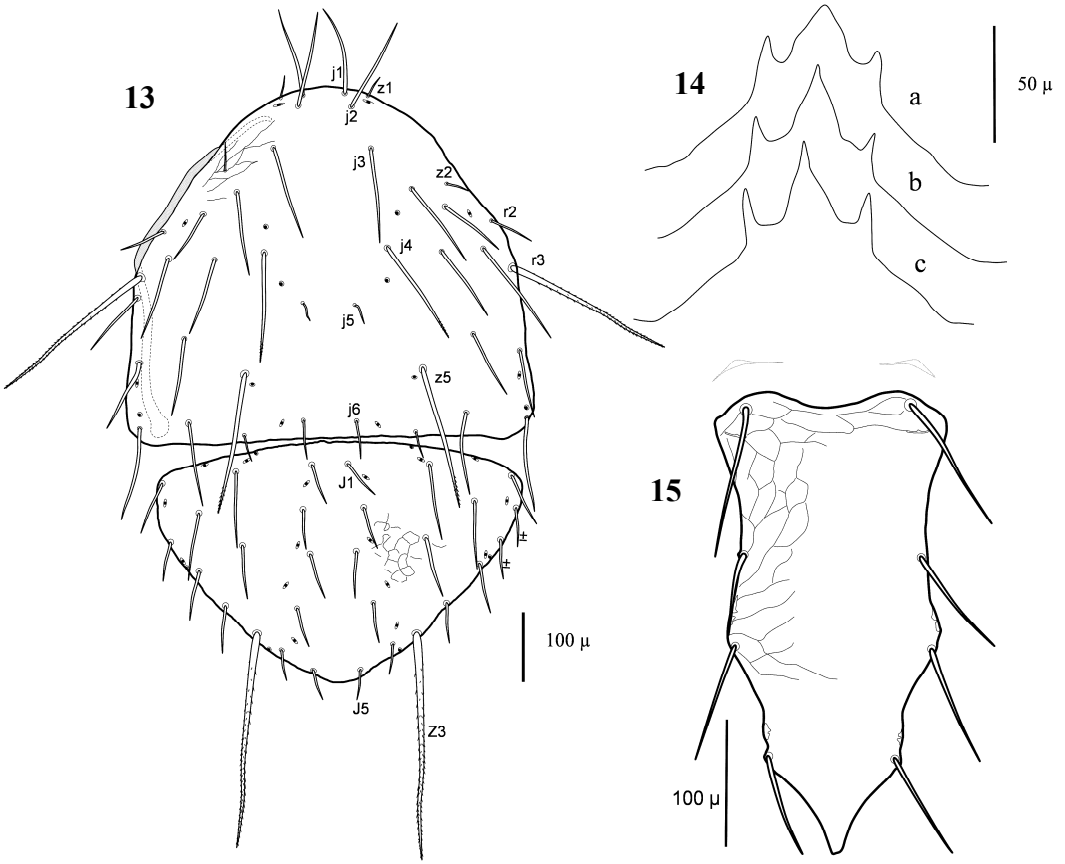
New data. **Mazandaran Province** (Galougah). Eight deutonymphs, ex. *E. pallens* collected in cow manure, N: 36 41, E: 53 50, 10 June 2007, Sh. Kazemi coll.; (Kelardasht, Derazmari). One deutonymph, cow manure, N: 40 32, E: 50 40, 13 June 2010, Y. Ahangaran coll.

Parasitus lunariphilus Makarova, 1996
(Figs. 13–15)

Parasitus lunariphilus.— Makarova, 1996: 922.

Diagnosis

Deutonymph. Dorsal shield partly covered with podonotal and opisthonotal shields (Fig. 13). Podonotal shield with 20 pairs of setae heterogeneous in length, *r3* longest, *j5* shortest, setae *j5*, *j6*, *z1*, *z2* and *z6* finely barbed, others plumose; opisthonotal shield normally with 14 pairs of heterogeneous in length setae, *Z3* very long, much stouter and pubescent, others finely barbed, *J5* and *Z5* shortest. Presternal sclerites weakly sclerotized; sternal shield reticulate, with four pairs of setae and three pairs of lyrifissures, *st1* considerably longer than others (Fig. 15). Tectum is shown in Fig. 14.



Figures 13–15. *Parasitus lunariphilus*, deutonymph. 13. Dorsal idiosoma; 14. a-c. Variation in tectum, 15. Sternal shield and presternal sclerites.
Studied materials. *Deutonymph.* Podonotal shield 463–536 long, 548–618 wide; opisthonotal shield 321–366 long, 493–560 wide; sternal shield 288–306 long, 126–141 wide.

Occurrence in Iran

New data. **Mazandaran Province** (Noor, Noor Forest). One deutonymph ex. *Margarinotus bipustulatus* Schrank, 21 May 2008, Sh. Kazemi coll.; (Abbas Abad, Kuti Bazar). 15 deutonymphs, litter, N: 40 60, E: 50 13, 19 April 2010, Y. Ahangaran coll.; (Nowshahr, Narenjbon). Four deutonymphs, litter, N: 40 44, E: 57 79, 7 September 2010, Y. Ahangaran coll.

Note. Makarova (1996) collected this species from Kalmykia and Talish, west Caspian Sea area, associated with *Copris lunaris* L., its nest and eggs, and also she collected one female specimen in horse dung. This is the second report of this species in the world and it was found associated with *Margarinotus bipustulatus* and collected in litter in south of Caspian Sea. So, it seems *P. lunariphilus* has a restricted geographical distribution in west and south Caspian Sea which has high humidity condition because we could not find it in other area (with low, moderate and high humidity) in Iran and also nobody reported it from other countries yet.

Genus *Cornigamasus* Evans & Till, 1979
Type species: *Cornigamasus lunaris* (Berlese, 1882) [*Gamasus coleoptratum* var. *lunaris* Berlese, 1882]

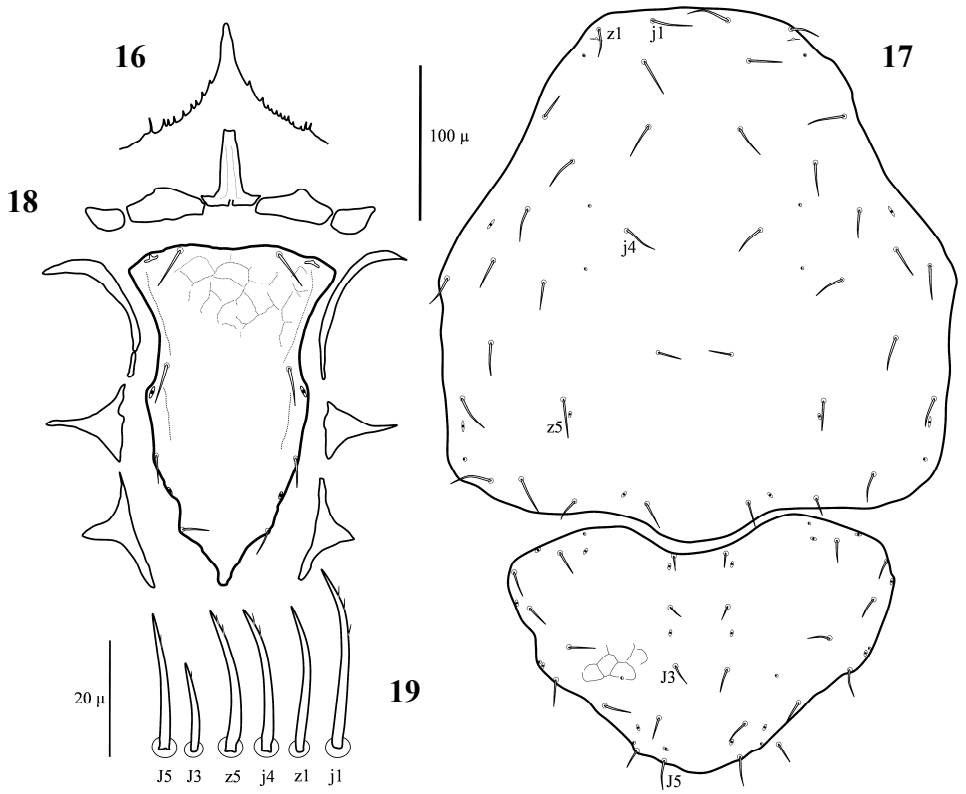
Cornigamasus lunaris (Berlese, 1882)
(Figs. 16–19)

Parasitus lunaris.— Micherdziński 1969: 437; Karg 1971: 446.
Parasitus (*Coleogamasus*) *lunaris*.— Tichomirov 1977: 85, 89.
Cornigamasus lunaris.— Evans & Till 1979: 209; Hyatt 1980: 324; Karg 1993: 460.

Diagnosis
Deutonymph. Podonotal shield almost two times larger than opisthonotal shield, posterior margin of shield convex, and fits closely into the concave medially anterior margin of opisthonotal shield, with 18 pairs of short setae, usually slightly barbed distally; opisthonotal shield with 12 pairs of short setae, some setae on lateral area may be asymmetrically absent (Figs. 17 & 19). Presternal elements broad, flanked basal area of tritosternum; sternal shield with four pairs of short and smooth setae and three pairs of lyrifissures (Fig. 18). Tectum subtriangular, median prong considerably large, smooth laterally and blunt, and lateral shoulders denticulate (Fig. 16).

Studied materials. *Deutonymph*. Podonotal shield 316–345 long, 291–324 wide; opisthonotal shield 133–145 long, 224–248 wide; sternal shield 203–212 long, 98–104 wide.

Occurrence in Iran
New data. **Mazandaran Province** (Kelardasht, Roudbarak). One deutonymph, soil, N: 40 36, E: 50 88, 13 June 2010, Y. Ahangaran coll.; **Kerman Province** (Joupar). 45 deutonymphs, cow manure, 12 July 2011, E. Arjomandi coll.; **Khorasan province** (Taybad, Jiz Abad). Three deutonymphs, ex. an unidentified Diptera, N: 34 57, E: 60 25, 5 June 2006, H. Hajiqanbar coll.



Figures 16–19. *Cornigamasus lunaris*, deutonymph. 16. Tectum; 17. Dorsal idiosoma; 18. Base of tritosternum, presternal sclerites and sternal shields; 19. Some dorsal shields setae.

Genus *Trachygamasus* Berlese, 1906
Type species: *Trachygamasus pusillus* (Berlese, 1892) [*Gamasus pusillus* Berlese, 1892]

Trachygamasus gracilis Karg, 1965

Occurrence in Iran

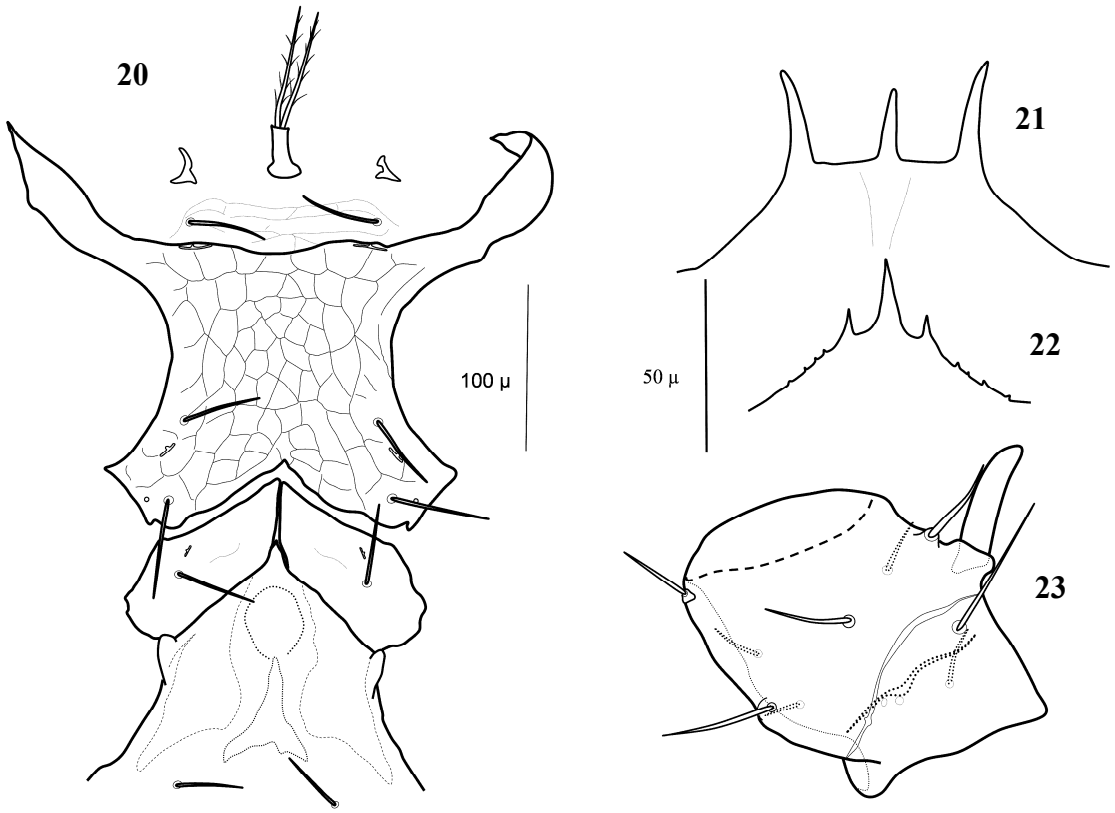
Previous data. **Semnan and Tehran Provinces.** Carcass of rat (Kamali *et al.* 2001).

Genus *Vulgarogamasus* Tikhomirov, 1969
Type species: *Vulgarogamasus burchanensis* (Oudemans, 1903) [*Parasitus burchanensis* Oudemans, 1903]

Vulgarogamasus kraepelini (Berlese, 1905)
(Figs. 20-21)

Vulgarogamasus kraepelini.— Micherdziński 1969: 573; 1971: 450; Hyatt 1980: 297; Karg 1993: 476.

Parasitus (*Eugamasus*) *kraepelini*.— Tichomirov 1977: 63.



Figures 20–23. 20. *Vulgarogamasus kraepelini*, tritosternum, presternal sclerites, sternal, metasternal and genital shields of female; 21. *Vulgarogamasus kraepelini*, female tectum; 22. *Gamasodes spiniger*, deutonymph tectum; 23. *Gamasodes spiniger*, femur II, anterolateral view.

Diagnosis
Female. Dorsal idiosoma almost completely covered with two sub-equal, reticulated podonotal and opisthonotal shields, bearing 22 and 25 pairs of finely pilose setae, respectively. Podonotal setae, except *z2* and *s2* as shortest (smooth), and *r3* as longest (considerably plumose), sub-equal in length and pass the base of the following setae; opisthonotal setae slightly increase in length posteriorly and usually pass the base of the next setae. Presternal elements very small; sternal setae *st1* off the shield, on weakly sclerotized presternal area; sternal shield rather reticulate, anterior margin of shield slightly concave; genital shield wide, pointed anteriorly with a pair of lateral horns (Fig. 20). Post-anal seta longer and stouter than para-anal setae. Tectum with three prongs, the median one shorter than laterals (Fig. 21).
Studied materials. Female. Podonotal shield 479 long, 577 wide; opisthonotal shield 409 long, 567 wide; sternal shield 132 long, 151wide, *j1* 67, *j4* 97, *z5* 112, *r3* 211, length of opisthonotal setae 61–76.

Occurrence in Iran

New data. **Mazandaran Province** (Tonekabon, Kol-lat Forest). One female, soil and litter, N: 40 64, E: 48 95, 7 June 2010, Y. Ahangaran coll.

Vulgarogamasus oudemansi (Berlese, 1904)

Occurrence in Iran

Previous data. **Kohgiluyeh and Boyer-Ahmed Province** (Gachsaran). Soil of corn and rape-seed farms (Moradian *et al.*, 2011).

Genus *Gamasodes* Oudemans, 1939
Type species: *Gamasodes spiniger* (Oudemans, 1936) [*Gamasoides spiniger* Oudemans, 1936]

Gamasodes spiniger (Trägårdh, 1910)
(Figs. 22–23)

Gamasodes spiniger.— Micherdziński 1969: 616; Karg 1971: 416; Tichomirov 1977: 94, 95; Evans & Till 1979: 210.

Occurrence in Iran

Previous data. **Kohgiluyeh & Boyer Ahmed Province** (Gachsaran). Soil of corn and rape-seed fields (Moradian *et al*. 2011).

New data. **Mazandaran Province** (Tonekabon, Konseh Forest). 6 deutonymphs, soil and litter, N: 40 62, E: 47 05, 1 May 2010, Y. Ahangaran coll.

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مرور کنه‌های خانوادهٔ Parasitidae (Acari: Mesostigmata) ایران

چکیده

کنه‌های خانوادهٔ Parasitidae ایران با استفاده از منابع و نمونه‌های جمع‌آوری شده مرور و بررسی شدند. گونه‌های *Cornigamasus lunaris* Berlese، *Parasitus lunariphilus* Makarova، *P. mustelarum* Oudemans و *Vulgarogamasus kraepelini* (Berlese) برای نخستین بار از ایران گزارش می‌شوند. نمونه‌هایی که پیش‌تر به عنوان *Parasitellus talparum* (Oudemans) گزارش شده بودند بازبینی و *P. fucorum* (De Geer) تشخیص داده شدند. همچنین کلیدی برای شناسایی جنس‌های این خانواده، پراکندگی و زیستگاه گونه‌های ایران ارایه شده است.

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