Records of Parasitidae and Laelapidae (Acari: Mesostigmata) from domestic animal manure in Khuzestan province, southwestern Iran with a new record for the Asian fauna

Sara Farahi¹, Parviz Shishehbor¹ & Alireza Nemati²

1 Department of Plant Protection, Faculty of Agriculture, Shahid Chamran University of Ahvaz, Ahvaz, Iran.
2 Department of Plant Protection, Faculty of Agriculture, Shahrekord University, Shahrekord, Iran.

ABSTRACT. Mites of the families Parasitidae and Laelapidae (Acari: Mesostigmata) are among the most common and widely distributed mites of the suborder Gamasina. During 2015-2017, fauna of parasitid and laelapid (Acari: Mesostigmata) mites from domestic animal manure collected and surveyed in Khuzestan Province, southwestern Iran. Totally, four Parasitidae species belonging to three genera and seven Laelapidae species belonging to four genera collected from domestic animal manure in Khuzestan Province. Among them, Cornigamasus ocliferius Skorupski & Witalinski, 1997 is a new record for mite fauna of Asia and Androlaelaps projecta Furman, 1972 is a new name for mite fauna of Iran. Four species are new to Khuzestan Province fauna as well. We also recorded six manure-associated species which have never been previously reported from manure in Iran. Parasitus fimetorum (Berlese, 1904) was the most frequent Parasitidae species among our records. The mites distribution and habitats data in Khuzestan Province are provided for all of the species, together with some taxonomic and bio-ecological notes.

Key words: Mesostigmata, Cornigamasus ocliferius, Manure-inhabiting mites, Ahvaz


Introduction

The Parasitidae Oudemans (Acari: Mesostigmata) are among the most common and widely distributed mites of the suborder Gamasina which comprises two subfamilies, Parasitinae Oudemans and Pergamasinae Juvara-Bals (Beaulieu et al., 2011; Hyatt, 1980). The Parasitidae is a family of important predatory mites found in litter and humus, and certain species are especially abundant in accumulations of organic material such as rotting seaweed, compost, manure and in the subterranean nests of small mammals (Hyatt, 1980; Karg, 1993; Blackman, 1997). Mites of this family mainly predate on soil-inhabiting microarthropods and nematodes and disperse phoretically through their deutonymphal stage on insects (mostly of the orders Coleoptera and Hymenoptera) (Beaulieu et al., 2011).
The family Laelapidae Berlese comprises a multitude of genera and species of morphologically and ecologically diverse mites that are free living, parasites and predators (Lindquist et al., 2009). Mites of the family Laelapidae are found commonly in such habitats as manure, litter and soil, and in association with arthropods, mammals and birds. Most species have been found in the soil-litter habitats as free-living predators, but some are found in the nests or on the body of arthropods or rodents (Rosario, 1981; Strong & Halliday, 1994; Beaulieu, 2009; Faraji & Halliday, 2009; Gwiazdowicz et al., 2018; Lindquist et al., 2009; Nemati & Mohseni, 2013). Laelapid mites have a suppressive effect on pest insect populations and adding composting manure to the soil as a means of increasing mite numbers has resulted in promoting the pest’s control (Hagen et al., 1999). Members of the genera Cosmolaelaps Berlese, Gaemelaelaps Evans & Till, Hypoaspis Berlese and Androlaelaps Berlese have been collected in manure, litter or soil substrates in Iran, while species of these and other genera are routinely or occasionally encountered in the nests of mammals or arthropods or directly associated with insects (Gwiazdowicz et al., 2018; Kazemi & Rajaee, 2013; Nemati et al., 2018).

The early results on manure-inhabiting mites were previously published by Farahi et al. (2018b). Here we aim to report some Parasitidae and Laelapidae records from southwestern Iran which were collected during faunistic surveys on manure-inhabiting mites. A Parasitidae species is presented for the first time from Asia together with taxonomic discussion on the species.

Material and methods
This study was conducted in Ahvaz and its vicinity in Khuzestan Province, southwestern Iran, over a period of two years (April, 2015 to April 2017). Mites were collected and extracted from different manure types of domestic animals and poultry, using Berlese-Tullgren funnels. The specimens were placed in Nesbitt’s solution and Lactophenol (1:1) for clearing and then permanently mounted in Hoyer’s medium on microscope slides. Specimens were then sorted and identified to species level based on available related literatures. Host and habitats of previously reported species have only been mentioned for those which recorded from Khuzestan Province based on available literature. Collected specimens were deposited in the Insect and Mite Collection of Ahvaz (IMCA), Department of Plant Protection, Shahid Chamran University of Ahvaz, Ahvaz, Iran. In this study the notations of dorsal and ventral chaetotaxy, poroidotaxy/adenotaxy have been used according to Witalinski’s work which are based on Lindquist & Evans (1965), Evans & Till (1979) which connects poroids/gland pores with setae, but also by Lindquist & Moraza (1998), whereas poroidotaxy/adenotaxy on Johnson & Moraza (1991) and most recently, on Moraza & Pena (2005), with some necessary adjustments for Parasitidae.

Results
In total, four species belonging to three genera of Parasitidae and seven species belonging to four genera of Laelapidae were collected and identified from domestic animal manure in Khuzestan Province, from which the Parasitidae species Cornigamasus ocliferius Skorupski & Witaliński, 1997 is a new species record from Asia.
Family Parasitidae Oudemans, 1901
Cornigamasus Evans and Till, 1979
Cornigamasus ocliferius Skorupski & Witaliński, 1997
Cornigamasus ocliferius Skorupski & Witaliński, 1997; Witaliński et al., 2005: 146; Witaliński, 2014: 341.

Studied materials and related host/habitat: one female, one male, three deutonymphs, Ahvaz, Gavmish Abad, 31°17′34″ N, 48°40′05″ E, 15 m, 24.IV.2015 (buffalo manure); five deutonymphs, Bavi, Mollasani, 31°35′31″ N, 48°53′10″ E, 27 m, 14.V.2015 (cow manure), one female, three deutonymphs, 20.X.2015 (buffalo manure), two deutonymphs, 16.VI.2015 (sheep manure), three females, one male, two deutonymphs, 23.X.2016 (cow manure); four deutonymphs, Shush, Khavar-e Seyyed Khalaf, 31°31′23″ N, 48°49′31″ E, 25 m, 8.VI.2015 (buffalo manure), one female, two males, 9.X.2016 (cow manure); one female, seven deutonymphs Ahvaz, dairy farm at Shahid Chamran University campus, 32°17′59″ N, 48°39′39″ E, 15 m, 28.VI.2015 (cow manure), one female, three deutonymphs, 17.VI.2015 (cow manure), three deutonymphs, 29.V.2016 (cow manure); four deutonymphs, Shush, Beyt-e Juh, 31°57′50″ N, 48°17′42″ E, 64 m, 13.VII.2015 (cow manure); three deutonymphs, Ahvaz, Jassaniyeh-ye Kuchak, 31°24′10″ N, 48°44′58″ E, 21 m, 29.IX.2015 (cow manure); three deutonymphs, Ahvaz, 31°23′02″ N, 48°38′38″ E, 18 m, 30.XI.2015 (horse manure); four deutonymphs, Hamidieh, 31°28′39″ N, 48°26′44″ E, 29 m, 12. XII.2015 (buffalo manure), three deutonymphs, 22.IV.2016 (buffalo manure); three deutonymphs, Ahvaz, Nabi-ye Akram village, 31°26′15″ N, 48°45′11″ E, 18 m, 6.IV.2016 (cow manure); four deutonymphs, Ahvaz, Alhaei, 31°39′20″ N, 48°35′26″ E, 31 m, 29.IV.2016 (cow manure); one female, three deutonymphs, Shush, Abdolkhani, 31°52′29″ N, 48°20′30″ E, 43 m, 6.V.2016 (cow manure); four deutonymphs, Shushtar, Band-e Qir, 31°39′10″ N, 48°53′09″ E, 26 m, 13.V.2016 (cow manure); two deutonymphs, Hamidieh, Pich-e Seyyed Jaber, 31°27′34″ N, 48°25′26″ E, 21 m, 20.X.2016 (buffalo manure); ten females, five males, Hamidieh, Tarahahye, 31°25′21″ N, 48°23′21″ E, 18 m, 20.V.2016 (buffalo manure); three deutonymphs, Ahvaz, Daghaghleh, 31°23′31″ N, 48°41′28″ E, 20 m, 29.V.2016 (cow manure).

Deutonymph. Idiosoma: length 323-418 μm, width 212 μm. Podonotal shield possesses 18 pairs of setae. Opisthonomial shield triangular with straight posterolateral margins. It has 9 pairs of setae, J4 missing, S3 and J5 are placed outside the shield (Fig. 1). Prestermal plates and sternal shield not clearly visible. Two pairs of sclerites situated between st5, JVI and ZVI setae in the poststernal region. A third pair of larger regular sclerites exists laterally (Fig. 2). Central projecting pointed part of epistome has denticulate lateral margins (Fig. 3).

Male. Idiosoma: length 610-666 μm, width 393 μm entirely sclerotized, a transverse suture separated podonotum (372 μm long) and opisthonomotum (294 μm). Seta j3 on podonotum is enlarged and pilose; seta J4 on opisthonomotum is finely pilose, seta J5 is setose but not stout, and an additional seta jx exists. Therefore, there are five pairs of stout and pilose setae on podonotum: j1, j3, r3, j4 and z5. On opisthonomotum there are only three pairs of stout and pilose setae: J6, Z1, Z3 (Fig. 4). The tritosternum absent. Anterior margin of sternum has a shallow depression between setae st1, and two indentations facing the lateral sides of prestermal platelets. The sternal and opisthogastric shields are separated by suture. Platelets are situated on each side of genital opening which their anterior-most parts are fragmented. Orderly embowed anterior boundary of genital lamina is shown in Fig. 5. The epistome has a median large projection (Fig. 6).
Female. Idiosoma: length 723–811 µm, width 415 µm. Podonotal shield has 22 pairs of setae including setae r2 and r4 which situated near the shield margin due to flexible cuticle.

Setae j1, j3, j4, z5 and r3 are stout (club-shaped) and terminally pilose (r3 figured distinctly). The opisthonotal shield is rather small and possesses 9 pairs of setae which 2 of them (Z1 and Z3) are stout and terminally pilose (Fig. 7). Presternal plates are ellipsoidal and large. The sternal shield is not reticulated, its anterior margin has a shallow incision, whereas the posterior margin is irregularly truncate and medially hollowed (Figs. 8, 9). Sternal setae st2 are shorter and more robust than setae st1 and st3. The opisthogastric shield is narrowed posteriorly and fused with a small perianal plate by a slender junction of cuticle. It has 6 pairs of setae, the posteriormost pair (V8) is stout (Fig. 8). The genital shield is presented in figure 9. Paragynia are not clearly visible. Epigynial plate terminates anteriorly with a narrow and long central prong. Epistome seen as a long smooth median projection with truncated end based on a denticulate basis (Fig. 10).

General Distribution: Poland, wet and rotten haystack on grasslands (Witaliński, 2014); Egypt, cow dung (Negm, 2016). This is the first record for the Asian mite fauna.


Remarks
The close species Cornigamasus lunaris (Berlese, 1882) occurs in Mazandaran, Guilan, Khorasan and Kerman Provinces. Since both species are similar in general appearance, C. ocliferius may be misidentified as C. lunaris. However, the diagnostic features can be summarized as follows:

Female: In C. ocliferius tarsi of leg I devoid of ambulacrum, podonotum with five and opisthonotum with two pairs of stout and terminally pilose setae. Endogynium elongated.
While, in \textit{C. lunaris} tarsi I ending in ambulacrum. Podonotum with four and opisthonotum with three pairs of stout and pilose setae. Endogynium subspherical.

**Male:** There is no ambulacrum on tarsi I in \textit{C. ocliferius}, whereas tarsi I ending with ambulacrum in \textit{C. lunaris}. In \textit{C. ocliferius} femur II with only one small conical main spur, but in the latter species with large curved main spur and small axillary spur; each of genu II and tibia II bear one small spur.

Deutonymph: In \textit{C. ocliferius} opisthonotum with nine pairs of setae and movable digit of chelicera with five teeth; whereas in \textit{C. lunaris} opisthonotum with 12 pairs of setae and movable digit of chelicera with three teeth.

**Parasitus Latreille, 1795**

**Parasitus beta** Oudemans & Voigts, 1904

\textit{Parasitus beta} Oudemans & Voigts, 1904: 652.

**Parasitus beta** Hyatt, 1980: 260.

**Previous record:** This is a new record for Khuzestan province fauna.

**Studied materials and related host/habitat:** one female, four deutonymphs, Ahvaz, Gavmish Abad, 31°17'34" N, 48°40'05" E, 15 m, 24.IV.2015 (buffalo manure), five deutonymphs, 13.XI.2016 (buffalo manure); three deutonymphs, Bavi, Gabir, 31°26'34" N, 48°45'17" E, 20 m, 2.V.2015 (sheep manure); five deutonymphs, Bavi, Shajaraat, 31°30'40" N, 48°54'27" E, 22 m, 8.VI.2015 (buffalo manure); one female, two deutonymphs, Ahvaz, dairy farm at Shahid Chamran University campus, 32°17'59" N, 48°39'39" E, 15 m, 28.VI.2015 (cow manure), five females, two deutonymphs, 22.XI.2015 (buffalo manure); two deutonymphs, Bavi, Mollasani, 31°35'31" N, 48°53'10" E, 27 m, 19.IX.2016 (cow manure), five females, two deutonymphs, 22.XI.2015 (buffalo manure), four deutonymphs, 16.VI.2016 (sheep manure), two deutonymphs, 25.VIII.2016 (buffalo manure); three deutonymphs, Ahvaz, Jassaniyeh-ye Kuchak, 31°24'10" N, 48°44'58" E, 21 m, 29.IX.2015 (cow manure); two deutonymphs, Hamidieh, 31°28'39" N, 48°26'44" E, 29 m, 5.XI.2015 (cow manure), two females, two deutonymphs, 22.IV.2016 (buffalo manure); one male, two deutonymphs, Ahvaz, 31°23'02" N, 48°38'38" E, 18m, 30.XI.2015 (horse manure), two females, two deutonymphs, Ahvaz, Nabi-ye Akram village, 31°26'15" N, 48°45'11" E, 18 m, 30.XI.2015 (cow manure); three deutonymphs, Hamidieh, Tarrahiye, 31°25'21" N, 48°23'21" E, 18 m, 10.III.2016 (cow manure); one female, four deutonymphs, Shush, Abdolkhan, 31°52'29" N, 48°20'30" E, 43 m, 6.V.2016 (buffalo manure); four deutonymphs, Shushtar, Arab Hassan, 31°49'44" N, 48°53'55" E, 30 m, 13.V.2016 (cow manure); six deutonymphs, Shush, Beyt-e Juhi, 31°57'50" N, 48°17'42" E, 64 m, 26.V.2016, (cow manure); two deutonymphs, Bavi, Talbumeh, 31°31'37" N, 48°55'27" E, 20 m, 9.X.2016 (cow manure); eight females, three deutonymphs, Susangerd, Abu Hamizeh, 31°31'48" N, 48°13'11" E, 15 m, 20.X.2016 (buffalo manure); two females, two deutonymphs, Bavi, Veys, 31°28'56" N, 48°52'41" E, 24 m, 23.X.2016 (cow manure).

**Note:** Kamali et al. (2001) and Pakyari et al. (2006) recorded this species as \textit{P. eta} Oudemans & Voigts, 1904, while \textit{P. eta} has been considered as a junior synonym of \textit{P. beta} (Karg, 1993).
Parasitus fimetorum (Berlese, 1904)
Gamasus fimetorum Berlese, 1904: 238.

Previous record: This species has been previously recorded from Khuzestan Province from soil (Kazemi & Rajaei, 2013).

Studied materials and related host/habitat: six deutonymphs, Bavi, Mollasani, 31°35’31″ N, 48°53’10″ E, 27 m, 8.IV.2015 (sheep manure), five deutonymphs, 14.V.2015 (cow manure), four deutonymphs, 30.VIII.2015 (buffalo manure), four females, four deutonymphs, 22.XI.2015 (buffalo manure), four deutonymphs, 25.VIII.2016 (sheep manure), two females, four males, 23.X.2016 (cow manure), six deutonymphs, 12.IV.2017 (sheep manure); one female, three deutonymphs, Ahvaz, Gavmish Abad, 31°17’34″ N, 48°40’05″ E, 15 m, 24.IV.2015 (buffalo manure); four deutonymphs, Bavi, Gabir, 31°26’34″ N, 48°45’17″ E, 20 m, 2.V.2015 (sheep manure), four deutonymphs, 3.III.2017 (poultry manure); four deutonymphs, Ahvaz, dairy farm at Shahid Chamran University campus, 32°17’59″ N, 48°39’39″ E, 15 m, 26.V.2015 (cow manure), one female, four deutonymphs, 28.VI.2015 (cow manure), four deutonymphs, 17.I.2015 (cow manure), five deutonymphs, 17.XI.2015 (cow manure), five deutonymphs, 29.V.2016 (cow manure); four deutonymphs, Bavi, Shajaraat, 31°30’40″ N, 48°54’27″ E, 22 m, 8.VI.2015 (buffalo manure); four deutonymphs, Shush, Beyt-e Juhi, 31°57’50″ N, 48°17’42″ E, 64 m, 13.VII.2015 (poultry manure); one male, three deutonymphs, 13.XII.2015 (cow manure); six deutonymphs, Shushtar, Arab Hassan, 31°49’44″ N, 48°53’55″ E, 30 m, 2.III.2016 (sheep manure); five deutonymphs, Hamidieh, Tarrahiye, 31°25’21″ N, 48°23’21″ E, 18 m, 10.III.2016 (buffalo manure); eight deutonymphs, Ahvaz, Nabi-ye Akram village, 32°16’15″ N, 48°45’11″ E, 18 m, 6.IV.2016 (cow manure); five deutonymphs, Ahvaz, Alhaie, 31°39’20″ N, 48°35’26″ E, 31 m, 29.IV.2016 (cow manure); four deutonymphs, Shush, Abdolkhan, 31°52’29″ N, 48°20’30″ E, 43 m, 6.V.2016 (buffalo manure); six deutonymphs, Shushtar, Band-e Qir, 31°39’10″ N, 48°53’09″ E, 26 m, 13.V.2016 (cow manure); one female, three deutonymphs, Shush, Beyt-e Jazayer, 32°00’56″ N, 48°17’27″ E, 60 m, 26.V.2016 (cow manure); four deutonymphs, Ahvaz, Ebadeh, 31°26’14″ N, 48°45’07″ E, 20 m, 16.VI.2016 (cow manure); three deutonymphs, Bavi, Talbume, 31°31’37″ N, 48°55’27″ E, 20 m, 9.X.2016 (cow manure); one male, three deutonymphs, Hamidieh, Pich-e Seyyed Jaber, 31°27’34″ N, 48°25’26″ E, 21 m, 20.X.2016 (cow manure); four males, six deutonymphs, Susangerd, Abu Hamizeh, 31°31’48″ N, 48°13’11″ E, 15 m, 20.X.2016 (buffalo manure); one male, four deutonymphs, Ahvaz, Gavmish Abad, 31°17’34″ N, 48°40’05″ E, 15 m, 13.XI.2016 (buffalo manure); three deutonymphs, Bavi, Naddafieh, 31°36’20″ N, 48°52’59″ E, 27 m, 13.XI.2016 (sheep manure).

Rhabdocarpais Athias- Henriot, Claire, 1981

Rhabdocarpais mammillatus (Berlese, 1904)
Gamasus mammillatus Berlese, 1904: 166.

Previous record: This is a new record for Khuzestan province fauna.

Studied materials and related host/habitat: one female, three deutonymphs, Bavi, Mollasani, 31°35’31″ N, 48°53’10″ E, 27 m, 8.IV.2015 (sheep manure), two deutonymphs, 2.IX.2015 (sheep manure), one female, four deutonymphs, 19.IX.2015(buffalo manure), four deutonymphs, 25.VIII.2016 (sheep manure); three deutonymphs, Ahvaz, Gavmish Abad, 31°17’34″ N, 48°40’05″ E, 15 m, 24.IX.2015 (buffalo manure); two deutonymphs Ahvaz, dairy farm at Shahid Chamran University campus, 32°17’59″ N, 48°39’39″ E, 15 m, 26.V.2015 (cow manure), one female, two males, 28.VI.2015 (cow manure), three deutonymphs, 17.IX.2015 (cow manure), two deutonymphs, 27.VI.2016 (cow manure); four deutonymphs, Shush, Khavar-e Seyyed Khalaf, 31°31’23″ N, 48°49’31″ E, 25 m, 8.VI.2015 (buffalo manure); three
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deutonymphs, Shush, Khoyes, 32°01'53" N, 48°16'45" E, 60 m, 13.IX.2016 (buffalo manure); six deutonymphs, Shush, Abdolkhan, 31°52'29" N, 48°20'30" E, 43 m, 6.V.2016 (buffalo manure); five deutonymphs, Shush, Beyt-e Juhi, 31°57'50" N, 48°17'42" E, 64 m, 26.V.2016 (cow manure); four deutonymphs, Ahvaz, Hatam village, 31°51'35" N, 48°21'31" E, 36 m, 11.V.2017 (sheep manure).

Family Laelapidae Berlese, 1892

*Androlaelaps* Berlese, 1903

*Androlaelaps casalis* (Berlese, 1887)

*Laelaps casalis* Berlese, 1887: 8.

**Previous records:** This species has been previously recorded from Khuzestan Province from different insects of orders Coleoptera (Scarabaeidae, Carabidae), Hymenoptera (Formicidae) and Orthoptera (Kazemi & Rajaei, 2013).

**Studied materials and related host/habitat:** one female, Bavi, Mollasani, 31°35'31" N, 48°53'10" E, 27 m, 8.IV.2015 (sheep manure); one female, Ahvaz, Gavmish Abad, 31°17'34" N, 48°40'05" E, 15 m, 24.IV.2015 (buffalo manure); one female, Bavi, Naddafieh, 31°36'20" N, 48°52'59" E, 27 m, 19.XI.2016 (sheep manure).

**Note:** There is morphological variation in hind margin of sternal shield.

*Androlaelaps projecta* Furman, 1972

*Androlaelaps projecta* Furman, 1972: 54.

**Previous record:** This is a new name for Iran mite fauna.

**Studied materials and related host/habitat:** two females, Ahvaz, Gavmish Abad, 31°17'34" N, 48°40'05" E, 15 m, 24.IV.2015 (buffalo manure).

*Androlaelaps shealsi* Costa, 1968


**Previous record:** This is a new record for Khuzestan province fauna.

**Studied materials and related host/habitat:** four females, Ahvaz, Gavmish Abad, 31°17'34" N, 48°40'05" E, 15 m, 24.IV.2015 (buffalo manure).

*Androlaelaps sp.*

**Previous record:** three females, Bavi, Talbumeh, 31°31'37" N, 48°55'27" E, 20m, 9.X.2016 (cow manure).

**Note:** This currently undescribed laelapid species was collected from cow manure in rural districts.

*Cosmolaelaps* Berlese, 1903

*Cosmolaelaps brevipedestra* (Karg, 1985)


*Hypoaspis* (Cosmolaelaps) *brevipedestra* Karg, 1988: 516; Faraji et al., 2008: 207.


**Previous record:** This species has been previously recorded from Khuzestan Province from nest of ants (Kazemi & Rajaei, 2013; Nemati et al., 2018).
Studied materials and related host/habitat: three females, two males, Bavi, Mollasani, 31°35'31" N, 48°53'10" E, 27 m, 19.XI.2016 (cow manure).

Note: Some differences were observed between the original description and the holotype during studying type materials by the third author. For example, chelicerae are 6 denticulate whereas it was illustrated as 5 denticulate in the original description. Other differences were observed between shield patterns and some sizes with the original description (Nemati and Gwiazdowicz, 2016).

Gaeolaelaps Evans & Till, 1966
Gaeolaelaps khajooii Kazemi, Rajaei & Beaulieu, 2014

Previous record: This is a new record for Khuzestan province fauna.

Studied materials and related host/habitat: two females, Shush, Khavar-e Seyyed Khalaf, 31°31'23"N, 48°49'31" E, 25 m, 9.X.2016 (cow manure).

Hypoaspis minor (Costa, 1968)

Previous record: This species has been previously recorded from Khuzestan province from soil (Nemati et al., 2018).

Studied materials and related host/habitat: two females, Bavi, Mollasani, 31°35'31" N, 48°53'10" E, 27 m, 22.VI.2015 (cow manure).

Hypoaspisella Bernhard, 1971
Hypoaspisella linteyini Samšiňák, 1964
Hypoaspisella linteyini Samšiňák, 1964: 49.

Previous record: This species has been previously recorded from Khuzestan province from soil (Nemati et al., 2018).

Studied materials and related host/habitat: four females, two deutonymphs, Ahvaz, 31°23'02" N, 48°38'38" E, 18 m, 24.IV.2015 (horse manure); one female, 30.XI.2015 (horse manure); one female, Bavi, Mollasani, 31°35'31" N, 48°53'10" E, 27 m, 22.VI.2015 (cow manure); one female, 22.XI.2015 (buffalo manure), two females, 12.XII.2015 (sheep manure); one female, Hamidieh, 31°28'39" N, 48°26'44" E, 29 m, 22.IV.2015 (sheep manure); two females, Ahvaz, Alhaei, 31°39'20" N, 48°35'26" E, 31 m, 29.IV.2016 (sheep manure); one female, Shush, Seyyed Abbas, 31°49'49" N, 48°23'21" E, 40 m, 6.V.2016 (buffalo manure); two females, Bavi, Talbumeh, 31°31'37" N, 48°55'27" E, 20 m, 9.X.2016 (cow manure); four females, Bavi, Naddafieh, 31°36'20" N, 48°52'59" E, 27 m, 19.XI.2016 (sheep manure).

Discussion
The current findings were the continuation of a study conducted on the mesostigmatid mites associated with manure from Khuzestan Province, southwestern Iran by Farahi et al. (2018a, 2018b, 2019). According to our results, Corniganasus ocliferius is new to the Asian mite fauna from Iran. Androlaelaps projecta Furman, 1972 is a new name for Iran mite fauna. This species has previously recorded as Androlaelaps kifli Metwali & Ibrahim, 1985 and
Androlaelaps aegypticus Hafez, Elbadry & Naser, 1982 from Iran (Kazemi & Rajaei, 2013; Nemati et al., 2018). However, according to personal communication (the third author of present paper, A. N., with Dr. Nasr from Egypt) and taxonomic examination of characters in related species, these two mentioned species could be considered as junior synonyms of A. projecta. Four species were also new to Khuzestan Province fauna. Previously, 129 manure-inhabiting Mesostigmata from different Provinces of Iran were collected from animal manures (Kazemi & Rajaei, 2013; Nemati et al., 2018; Farahi et al., 2018a, 2018b, 2019). Here, we recorded six manure-associated species which were not previously reported from manure in Iran (R. mammillatus, A. projecta, A. shealsi, C. brevipedestra, G. khajooi, H. linteyini). We do expect to have a longer list of manure-inhabiting mesostigmatic mites in Iran through future studies. Parasitidae species were more abundant than Laelapidae among our records. The most widespread and the most frequent laelapid species in manures was H. linteyini. It has not been previously recorded from manure in Iran. P. fimetorum was also the most frequent Parasitidae species among our records.

Biological and environmental preferences of Cornigamasus have not studied yet. According to Witaliński (2014) and Witaliński et al. (2005), C. ocliferius is a rare species in haystacks habitats in Poland due to a strictly nidicolous existence in rodent nests from which it is only occasionally transported on the fur of rodents to vole-visited haystacks and similar places. However, in other localities we can find numerous specimens in other microhabitat such as compost and similar types of decomposed plant matter, like in the Iran (Witaliński, pers. comm.).

Animal manures possess a rich fauna of arthropods including significant percentage of mites. Hundreds of mite species occur as predators, fungivores, detritivores, and bacteriophages in dung substrates. Six mite families of Mesostigmata encountered in dung including Parasitidae and Laelapidae are predators. Some of their species prey on the eggs or early instar larvae of coprophagous flies, and may be effective on the population of pest flies (Krantz, 1983). According to Karg (1971), Koehler (1997) and Lindquist et al. (2009), preferred habitats of Parasitidae and Laelapidae are organic and forest soils, animal dropping and nests of birds and rodents. Their preferred food are small arthropods and nematodes. Moreover, Laelapidae can be found in stored products and has been recorded as ectoparasit of mammals, birds and insects. Our results imply such recorded habitats/food. The species of Macrochelidae prey on the eggs or early instar larvae of coprophagous flies, and are effective fly egg and larval predators (Krantz, 1983; Farahi et al., 2018a). The feeding of Parasitidae and Laelapidae species on fly eggs has been observed too. However, their efficiency has not been accurately assessed (Krantz, 1983).

Gaeolaelaps aculeifer (Canestrini, 1884) and A. casalis are two common laelapid species which have an important role in controlling the poultry red mite Dermanyssus gallinae De Geer, 1778 (Lesna et al., 2009). We recorded A. casalis in Ahvaz and Mollasani areas in this study. Some specimens of the poultry red mite were collected from poultry manures in Mollasani where the laelapid predatory species A. casalis was also obtained from dung samples. Same findings have reported by Arjomandi et al. (2013) in Kerman County.

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Conflict of Interests
The authors declare that there is no conflict of interest regarding the publication of this paper.

References


گزارشی از کنه‌های خانواده‌های Parasitidae و Laelapidae در کود دامی از (Acari: Mesostigmata) خوزستان استان جنوب غربی ایران و معرفی یک گزارش جدید برای فون آسیا

سارة فرحی۱، پرویز شیشه‌بر۱ و علیرضا نعمتی۲

۱ گروه گیاهپزشکی دانشکده کشاورزی دانشگاه شهید چمران اهواز، اهواز، ایران.
۲ گروه گیاهپزشکی دانشکده کشاورزی دانشگاه شهید چمران، شهرکرد، ایران.

* پست الکترونیکی: sara.farahi@gmail.com

چکیده: کنه‌های خانواده‌های Parasitidae و Laelapidae از رایج‌ترین و گسترده‌ترین کنه‌های زیر راسته Gamasina می‌باشند. در سال‌های ۱۳۸۴-۱۳۹۴ فقین کنه‌های کودزی Mesostigmata و Parasitidae و Laelapidae در استان خوزستان واقع در جنوب غربی ایران جمع‌آوری و مطالعه شدند. در مجموع، چهار گونه مربوط به سه جنس Mesostigmata از خانواده Parasitidae و هفت گونه مربوط به چهار جنس از خانواده Laelapidae جمع‌آوری و مطالعه شدند. از ویژگی‌های مشترکی که در میان آنها گونه Cornigamasus ocliferius (Skorupski & Witaliński, 1997) بین نام جدید برای فون پنهام Androlaelaps projecta Furman, 1972 می‌باشد. گونه وی از راسته متعدد‌دار (Berlese) ۱۹۰۴ به انتشار و زیستگاه نمایی گونه‌ها در استان خوزستان، همراه با یادداشت‌هایی در مورد تکامل و پیش‌درآمد ارائه شد.

واژگان کلیدی: میان استیگمایان (Mesostigmata)، کنه‌های کودزی، اهواز، Cornigamasus ocliferius