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Oribatid mites (Acari, Sarcoptiformes) of Sistan and Baluchestan province, Iran, with new records

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ABSTRACT. To study the fauna of oribatid mites (Oribatida) in Sistan & Baluchestan province (southeastern Iran), soil and leaf litter samples were collected in Saravan and Gulshan counties from March to September 2021. In total, 40 species belonging to 30 genera from 18 families were collected and identified, among them genera *Hoplophorella*, *Javacarus*, subgenera *Leptogalumna, Paralamellobates*, and seven species, *Acrotritia rustica* Niedbała, 1991, *Hoplophorella vitrina* (Berlese, 1913), *Javacarus foliatus* Hammer, 1972, *Lamellobates misella* (Berlese, 1910), *Rostrozetes ovulum ovulum* (Berlese, 1908), *Striatoppia* cf. *quadrilineata* Hammer, 1982, and *Scheloribates praelineatus* Hammer, 1977 are newly recorded for the fauna of Iran.

Key words: Distribution, eastern Iran, fauna, moss mites, soil biology

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INTRODUCTION

The mites of Oribatida known as moss mites, beetle mites and armored mites, are a suborder of mites, belonging to the superorder Acariformes, order Sarcoptiformes. They range in the body from 200 to 1400 micrometers. There are currently more than 11,000 species that have been identified (Subías, 2023), but researchers estimate that there may be anywhere from 50,000 to 100,000 total species (Schatz & Behan-Pelletier, 2008). The Sistan & Baluchestan province (25°03'–31°29'N, 58°49'–63°20'E) is the second largest province of Iran with an area of 181,758 square kilometres. Climatologically, the province is an arid and hot region. The average rainfall in the province is 110 mm (Mohammadi & Akbary, 2022). This province has 25 counties, two of which, Saravan and Gulshan, are located east of the province.

The first record of oribatid mite from Sistan & Baluchestan province was *Bicyrthermannia duodentata* Hammer, 1979 (family Nanhermanniidae) (Akrami & Teimoori, 2013). A subsequent study (Akrami et al., 2021) described and illustrated *Pergalumna sistanbaluchestanica* Akrami, 2021 (Galumnidae), which was collected from Hamun and Nimruz counties. They provided an identification key to known species of *Pergalumna* of the Palaearctic region. Ordouni et al. (2021) described *Haplochthonius* (*Haplochthonius*) *longiapophysus* Ordouni, Akrami & Ramroodi, 2021 (Haplochthoniidae) from Hirmand, Nimruz, and Iranshahr counties and provided an identification key to known species of the subgenus *Haplochthonius* (*H.*). In their faunistic surveys on oribatid mites in the Southeastern and central-eastern parts of Iran, Ordouni et al. (2022) reported *Graptoppia* (*Stenoppia*) *italica* (Bernini, 1973) (Oppiidae) for the first time from Iran, redescribed it and presented additional diagnostic characters based on

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materials collected from the counties of Zahak and Zabol (Sistan & Baluchestan province) and Birjand (South Khorasan province). The most notable work on oribatids of this region was conducted by Ordouni et al. (2023). They reported a total of 23 species belonging to 20 genera and 15 families of these mites from northern Sistan & Baluchestan province, of which two species, *Sellnickochthonius immaculatus* (Forsslund, 1942) and *Verachthonius* cf. *laticeps* (Strenzke, 1951), both from the family Brachychthoniidae, were new records for the mite fauna of Iran. Also, they presented an additional description and new illustrations of the adult of the latter species based on material collected from the province.

Before this research, no information was available on the oribatid fauna of Saravan and Gulshan. Therefore, we aimed to investigate the oribatid fauna of the Saravan and Gulshan counties in southeast Iran.

MATERIAL AND METHODS

Soil and litter samples were collected from various habitats within more than 20 different locations (Figs 1–2, Table 1) in Saravan and Gulshan counties, in Sistan & Baluchestan province, from March to September 2021, by Y. Arbab using a standard soil sampling technique. The mites were extracted using a modified Berlese funnel, cleared in lactophenol solution, and mounted in Hoyer's medium on glass microscope slides for identification. The slides were placed in an oven at 45 °C for a month, and then the specimens were examined using a light microscope (Zeiss Standard 20). Taxonomic classification follows Subías (2023). Data on both local and zoogeographical regions were compiled from the relevant records (Akrami, 2015; Akrami & Saboori, 2021; Subías, 2023). All specimens are deposited in the Acarological collection of the Department of Plant Protection, School of Agriculture, Shiraz University, Shiraz, Iran.

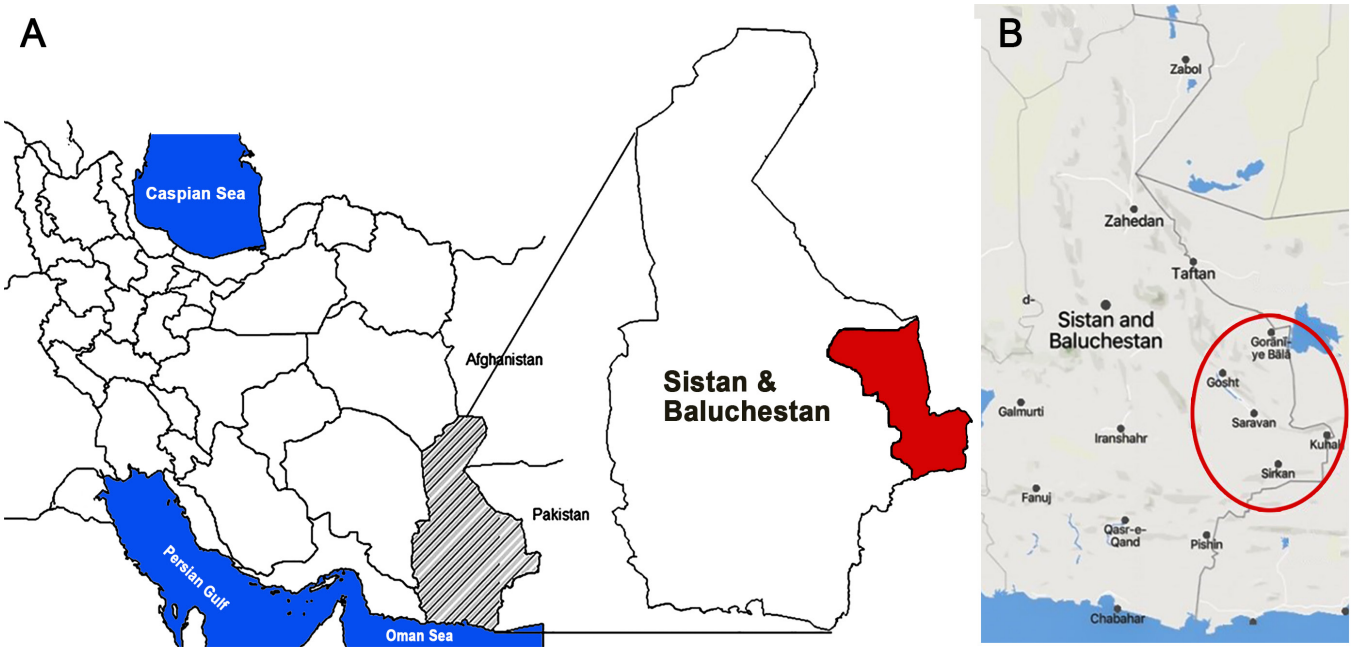

Figure 1. The sampling locations. **A.** Map of Iran, specifying Sistan & Baluchestan province (marked by crosshatched lines), and Saravan & Gulshan counties (marked by red colour). **B.** Map of Sistan & Baluchestan province, specifying sampling range in Saravan and Gulshan counties (marked by the red circle).

Table 1. The sampling data for the oribatid specimens from Sistan & Baluchestan province, Iran.

	Localities	Coordinate data	Altitude (m a.s.l.)	Sampling dates
1	Aspich	62°23′N, 27°19′E	1155	29 July 2021
2	Dehak (a)	62°31′N, 27°15′E	1152	12 Mar 2021
	Dehak (b)	62°36′N, 27°10′E	1130	23 Apr 2021
3	Esfandak (a)	62°49′N, 27°06′E	1039–1058	12 Mar 2021
	Esfandak (b)	62°43′N, 27°08′E	1080	12 Mar 2021
4	Gomban	62°30′N, 27°14′E	1143	29 July 2021
5	Gosht (a)	61°56′N, 27°47′E	1443–1447	26 Mar 2021
	Gosht (b)	61°56′N, 27°47′E	1446–1450	16 July 2021
6	Hoshak	62°17′N, 27°24′E	1182	06 Aug 2021
7	Jaleq	62°40′N, 27°36′E	855	02 Apr 2021
8	Kaladin (a)	62°47′N, 27°26′E	933	27 Aug 2021
	Kaladin (b)	62°20′N, 27°38′E	1316	27 Aug 2021
9	Kalagan (a)	62°46′N, 27°24′E	992	02 Apr 2021
	Kalagan (b)	62°46′N, 27°24′E	1010–1020	27 Aug 2021
10	Kalpuregan	62°31′N, 27°13′E	1110	23 Apr 2021
11	Kuhak	63°14′N, 27°08′E	1050	13 Aug 2021
12	Kunardan	62°35′N, 27°11′E	1134	23 Apr 2021
13	Kurosh (a)	63°40′N, 27°54′E	1309	21 Aug 2021
	Kurosh (b)	62°32′N, 27°18′E	1292	21 Aug 2021
	Kurosh (c)	62°30′N, 27°17′E	1159	21 Aug 2021
14	Murt	62°46′N, 27°08′E	1094	13 Aug 2021
15	Nahuk (a)	62°20′N, 27°38′E	1318–1328	19 Mar 2021
	Nahuk (b)	62°20′N, 27°38′E	1323–1329	04 Sept 2021
16	Saravan (a)	62°20′N, 27°21′E	1171	05 Mar 2021
	Saravan (b)	62°20′N, 27°21′E	1165	30 Mar 2021
	Saravan (c)	62°20′N, 27°21′E	1169	08 Apr 2021
	Saravan (d)	62°20′N, 27°21′E	1170	06 July 2021
	Saravan (e)	62°20′N, 27°21′E	1164	09 July 2021
	Saravan (f)	62°20′N, 27°21′E	1166	06 Aug 2021
	Saravan (g)	62°20′N, 27°21′E	1087–1178	24 Aug 2021
17	Shamsabad	62°11′N, 27°28′E	1182	16 July 2021
18	Sinkan (a)	62°32′N, 27°37′E	1038	02 Apr 2021
	Sinkan (b)	62°32′N, 27°37′E	1032–1039	27 Aug 2021
19	Sirkan (a)	62°32′N, 26°56′E	1241	30 Apr 2021
	Sirkan (b)	62°38′N, 26°49′E	1241	30 Apr 2021
20	Ziyarat	62°25′N, 27°18′E	1153	29 July 2021

The soil samples of various field crops, fruit orchards and livestock farms were categorized into several niches, from which the oribatid specimens were collected as follows: AL – Alfalfa plants, *Medicago sativa* L. (Fabaceae); AMA – Animal manure in the stable; AP – Apple trees, *Malus domestica* Borkh (Rosaceae); BO – Bitter orange trees, *Citrus aurantium* L., Rutaceae; CA – Common apricot trees, *Prunus armeniaca* L., Rosaceae; CF – Common fig trees, *Ficus carica* L., Moraceae; CO – Common olive trees, *Olea europaea L.*, Oleaceae; CP – Common plum trees, *Prunus domestica* L., Rosaceae; DP – Date palm trees, *Phoenix dactylifera* L., Aracaceae; GV – Common grape vine, *Vitis vinifera* L., Vitaceae; JU – Jujube plants, *Ziziphus* sp., Rhamnaceae; LE – Lemon trees, *Citrus limon* (L.), Rutaceae; ME – Mesquite trees, *Prosopis* sp., Fabaceae; NS – Weeds next to the stream; PE – Peach trees, *Prunus persica* (L.), Rosaceae; PI – Pistachio shrubs, *Pistacia vera* L., Anacardiaceae; PO – Pomegranate trees, *Punica granatum L.*, Lythraceae; SO – Sweet orange trees, *Citrus sinensis* (L.), Rutaceae; TA – Tamarisk plants, *Tamarix* sp., Tamaricaceae; WM – White mulberry trees, *Morus alba* L., Moraceae

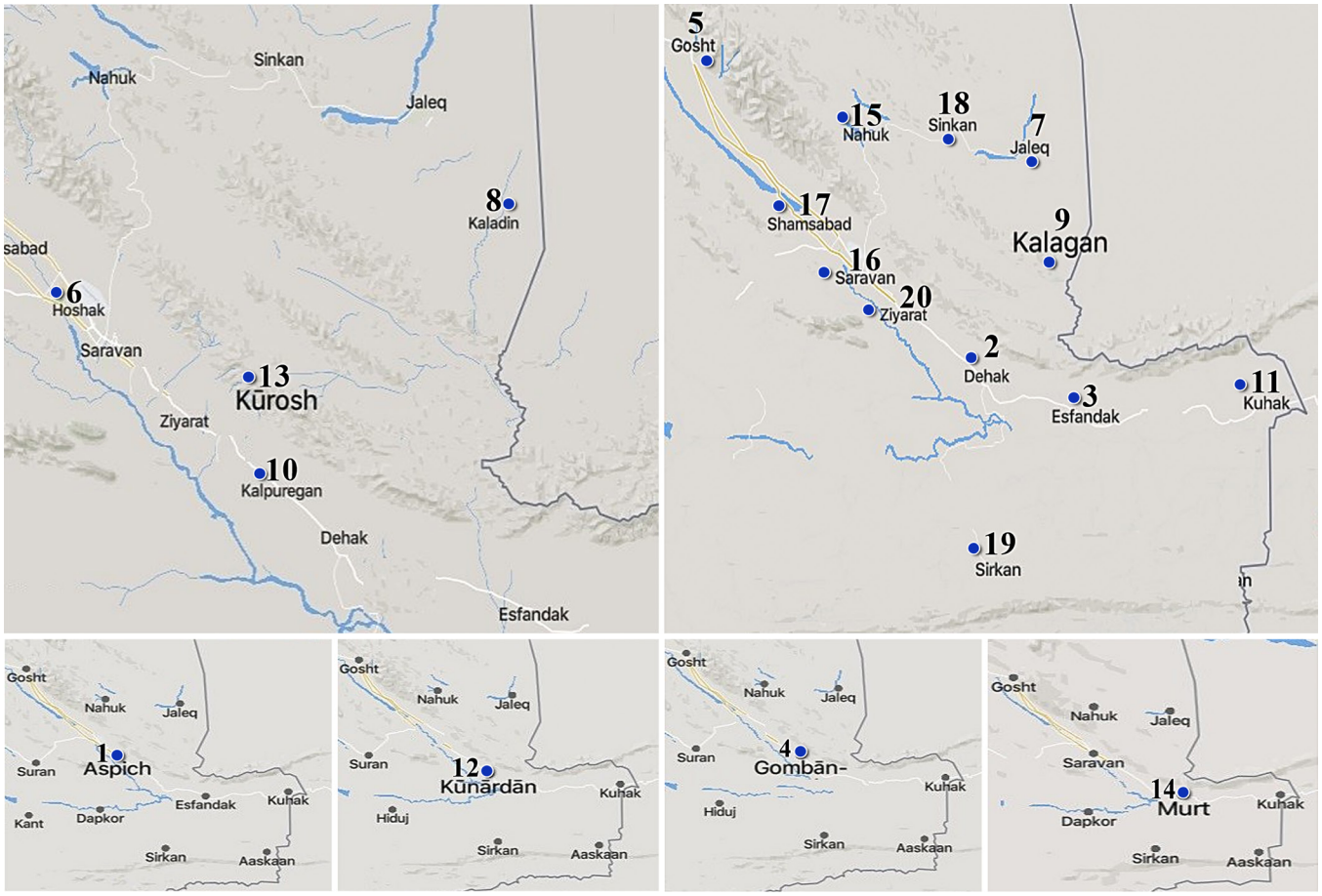

Figure 2. Map of Saravan and Gulshan counties (Sistan & Baluchestan province), with sampling locations.

RESULTS

During this study, 40 species belonging to 30 genera and 18 families of the oribatid mites were collected and identified, of which two genera, two subgenera, and seven species were recorded for the first time from Iran. Since most known species reported here are well recognizable, we do not intend to give re-descriptions of them. Abbreviations refer to the names of the sampling sites and habitats (Table 1, Figs 1–2). The species listed below are according to their taxonomic classification at the family level.

Taxonomic hierarchy

Phylum Arthropoda von Siebold, 1848

Order Sarcoptiformes Reuter, 1909

Suborder Oribatida Dugès, 1834

Family Sphaerochthoniidae Grandjean, 1947

Genus *Sphaerochthonius* Berlese, 1910

***Sphaerochthonius splendidus* (Berlese, 1904)**

Material examined. Esfandak: PO; Gosht (a): WM, CF.

Zoogeographical distribution. Ethiopian, Neotropical, Pantropical: Oriental, Australian (Australia and Polynesia), and Subtropical (southern Holarctic).

Distribution in Iran. East Azerbaijan, Fars, Guilan, Hamadan, Kerman, Kermanshah, Markazi, Mazandaran, Razavi Khorasan, West Azerbaijan, Yazd, and Zanjan provinces.

Family Cosmochthoniidae Grandjean, 1947

Genus *Cosmochthonius* Berlese, 1910

***Cosmochthonius reticulatus* Grandjean, 1947**

Material examined. Nahuk (a): DP; Nahuk (b): GV; Gosht (b): CF.

Zoogeographical distribution. Neotropical, Oriental (southeast China; India: west Bengal), and southern Palaearctic.

Distribution in Iran. East Azerbaijan, Fars, Kerman, Kermanshah, Razavi Khorasan, and Yazd provinces.

Family Phthiracaridae Perty, 1841

Genus *Hoplophorella* Berlese, 1923

***Hoplophorella vitrina* (Berlese, 1913)**

Material examined. Kalagan (b): GV.

Zoogeographical distribution. Pantropical and Subtropical.

Distribution in Iran. Sistan & Baluchestan province (**New generic record** for Iran).

Family Euphthiracaridae Jacot, 1930

Genus *Acrotritia* Jacot, 1923

***Acrotritia ardua ardua* (Koch, 1841)**

Material examined. Esfandak (a): GV; Nahuk (a): CF, GV; Nahuk (b): PO, DP, CA; Sinkan (a): GV; Sinkan (b): PO; Saravan (d): CF; Saravan (f): CF, GV; Gomban: WM.

Zoogeographical distribution. Cosmopolitan.

Distribution in Iran. Alborz, Ardabil, East Azerbaijan, Esfahan, Fars, Golestan, Guilan, Hamadan, Kurdistan, Khuzestan, Markazi, Mazandaran, Razavi Khorasan, Sistan & Baluchestan, Tehran, West Azerbaijan, Yazd, and Zanjan provinces.

***Acrotritia pirovaci* Niedbała, 2006**

Material examined. Kalpuregan: CO; Nahuk (b): PO, CA, CF, DP; Sinkan (b): AL, PO; Saravan (a): WM, GV, AP, CF; Saravan (b): PO, SO; Saravan (d): CF, CA; Kunardan: PO, PI; Gosht (a): WM; Gomban: WM, DP; Sirkan (b): DP; Murt: SO, PO; Hoshak: AL, NS.

Zoogeographical distribution. Southern Palaearctic.

Distribution in Iran. East Azerbaijan, Fars, Guilan, Kerman, Kermanshah, and Yazd provinces.

***Acrotritia simile* Mahunka, 1982**

Material examined. Kalagan (a): WM; Kalagan (b): GV, DP, WM; Kuhak: DP, AL, CF; Sinkan (a): AL, DP, CF; Sinkan (b): DP, PO; Kaladin (a): AL; Saravan (a): DP, PO, GV, SO, WM; Saravan (b): SO, PO; Saravan (d): WM, CA, AL; Saravan (e): CF; Saravan (f): CF; Saravan (g): AL, JU, BO; Hoshak: AL; Murt: LE, JU; Nahuk (a): CF, PO, CF; Gosht (a): PE, DP, GV, LE; Gosht (b): SO; Dehak (b): PE, LE, SO; Ziyarat: CA, GV; Aspich: SO; Gomban: DP, WM; Sirkan (b): GV; Kunardan: AP; Jaleq: SO, CF.

Zoogeographical distribution. Holarctic: southern Palaearctic (Turkey and eastern Palaearctic) and southeastern USA; Pantropical (in Australian: Australia and New Guinea).

Distribution in Iran. Yazd province.

***Acrotritia rustica* Niedbała, 1991**

Material examined. Sirkan (b): GV; Sinkan (a): AL; Sinkan (b): AL; Murt: NS; Saravan (c): DP; Saravan (d): CA; Saravan (g): BO; Gosht (a): PE, PO, CF, AL; Kalagan (a): PO; Kalagan (b): AL, PE; Nahuk (a): BO; Nahuk (b): DP; Aspich: NS, NS; Shamsabad: DP.

Zoogeographical distribution. Holarctic: southern Palaearctic and southeastern USA; Pantropical.

Distribution in Iran. Sistan & Baluchestan province (**New record** for Iran).

Family Lohmanniidae Berlese, 1916

Genus *Lohmannia* Michael, 1898

***Lohmannia* cf. *turcmenica* Bulanova-Zachvatkina, 1960**

Material examined. Sirkan (b): PO; Saravan (c): DP; Nahuk (b): DP.

Zoogeographical distribution. Neotropical (Argentina); Subtropical (southern Palaearctic); Tropical: Oriental (southeastern China).

Distribution in Iran. East Azerbaijan, Fars, Guilan, Hamadan, Khuzestan, Kurdistan, Markazi, Mazandaran, Razavi Khorasan, West Azerbaijan, and Zanjan provinces.

Genus *Javacarus* Balogh, 1961

***Javacarus foliatus* Hammer, 1972**

Material examined. Saravan (d): DP.

Zoogeographical distribution. Australian (Pacific Islands); Oriental (northeast India).

Distribution in Iran. Sistan & Baluchestan province (**New generic record** for Iran).

Genus *Papillacarus* Kunst, 1959

***Papillacarus* sp.**

Material examined. Kalpuregan: DP, CO; Kunardan: AP; Dehak (b): SO; Sirkan (b): PO; Hoshak: AL; Gomban: WM.

Remarks. More specimens are needed for accurate identification.

Family Epilohmanniidae Oudemans, 1923

Genus *Epilohmannia* Berlese, 1910

***Epilohmannia cylindrica cylindrica* (Berlese, 1904)**

Material examined. Ziyarat: GV; Kunardan: PO; Nahuk (a): PO; Nahuk (b): CF; Saravan (b): JU; Saravan (e): NS; Saravan (g): AL; Jaleq: PO; Shamsabad: DP.

Zoogeographical distribution. Cosmopolitan (Palaearctic, Nearctic, Ethiopian: Chad and Yemen, Oriental, Australian: Hawaii and Neotropical).

Distribution in Iran. Alborz, East Azerbaijan, Esfahan, Fars, Golestan, Guilan, Kerman, Kermanshah, Khuzestan, Kurdistan, Markazi, Mazandaran, Razavi Khorasan, Sistan & Baluchestan, Tehran, West Azerbaijan, Yazd, and Zanjan provinces.

***Epilohmannia pallida aegyptica* Bayoumi & Mahunka, 1976**

Material examined. Saravan (a): AP, AL, GV; Saravan (c): DP; Saravan (d): DP, AL; Saravan (e): CF, PO, CF, NS; Saravan (g): AL, JU, JU, BO; Esfandak (a): SO, CA, GV, SO, CF; Murt: LE, JU, PO, NS; Kalpuregan: AL, SO, DP; Nahuk (b): CF, DP, CA, CF, GV; Shamsabad: GV, WM, DP; Kurosh (a): CF; Hoshak: NS, DP, AL, CA, WM, AL, PO; Kaladin (a): DP, PO; Kunardan: AP; Sinkan (a): CF, DP, WM, PO; Kalagan (a): WM; Kalagan (b): WM; Gomban: WM; Dehak (b): PE, LE; Aspich: DP, PO; Sirkan (a): DP; Sirkan (b): PO, GV; Ziyarat: GV; Gosht (a): PO, WM, GV; Jaleq: PO.

Zoogeographical distribution. Southern Palaearctic (Eastern Mediterranean and Iran) and Vietnam.

Distribution in Iran. Fars, Guilan, Hamedan and Sistan & Baluchestan provinces.

Family Nothridae Berlese, 1896

Genus *Nothrus* Koch, 1835

***Nothrus anauniensis* Canestrini & Fanzago, 1877**

Material examined. Sinkan (b): CF; Nahuk (a): BO; Nahuk (b): GV, CA, SO; Saravan (a): GV; Saravan (d): DP, CA, CF; Saravan (f): GV; Gosht (a): CF, PE; Hoshak: DP, CA; Kalagan (a): AP, PO; Murt: JU, LE; Aspich: PO; Kaladin (a): PO; Gomban: WM.

Zoogeographical distribution. Cosmopolitan (except Antarctic).

Distribution in Iran. East Azerbaijan, Fars, Guilan, Hamadan, Kerman, Kermanshah, Khuzestan, Kurdistan, Lorestan, Markazi, Mazandaran, Tehran, West Azerbaijan, Yazd, and Zanjan provinces.

Family Damaeolidae Grandjean, 1965

Genus *Fosseremus* Grandjean, 1954

***Fosseremus* sp.**

Material examined. Saravan (g): AL.

Remarks. More specimens are needed for accurate identification.

Family Oppiidae Sellnick, 1937

Genus *Oppiella* Jacot, 1937

***Oppiella nova nova* (Oudemans, 1902)**

Material examined. Kalagan (a): PO; Shamsabad: GV; *Sirkan* (*b*): DP; Nahuk (b): CF.

Zoogeographical distribution. Cosmopolitan.

Distribution in Iran. Alborz, East Azerbaijan, Fars, Guilan, Kerman, Markazi, Mazandaran, Razavi Khorasan, West Azerbaijan, Yazd, and Zanjan provinces.

Genus *Discoppia* Balogh, 1983

Subgenus *Cylindroppia* Subías & Rodríguez, 1986

***Discoppia cylindrica* (Pérez-Íñigo, 1965)**

Subspecies *Dicoppia* (*C.*) *cylindrica rostroincisa* Subías & Rodríguez, 1986

Material examined. Aspich: DP.

Zoogeographical distribution. West-central Europe, Hispaniola (Dominican Republic), and Tanzania.

Distribution in Iran. Bushehr and Khuzestan provinces.

Genus *Anomaloppia* Subías, 1978

***Anomaloppia iranica* Bayartogtokh & Akrami, 2000**

Material examined. Gosht (a): PO; Nahuk (a): PO.

Zoogeographical distribution. Southern Palaearctic (eastern Mediterranean and Iran).

Distribution in Iran. Alborz, East Azerbaijan, Kerman, Lorestan, Razavi Khorasan, West Azerbaijan, Yazd, and Zanjan provinces.

Genus *Oppia* Koch, 1835

Subgenus *Lasiobelba* Aoki, 1959

***Oppia kuehnelti* Csiszár, 1961**

Material examined. Gosht (b): GV; Aspich: PO; Sinkan (a): PO, CF.

Zoogeographical distribution. Australian, Ethiopian, southern Palaearctic: eastern Mediterranean and Iran, Tropical (Oriental).

Distribution in Iran. East Azerbaijan and Khuzestan provinces.

Genus *Multioppia* Hammer, 1961

Subgenus *Hammeroppia* Vasiliu & Ivan, 2009

***Multioppia wilsoni laniseta* Moritz, 1966**

Material examined. Gomban: WM, GV, DP, BO, AL; Sinkan (b): DP; Nahuk (b): GV; Saravan (a): CA; Saravan (d): CA, WM; Saravan (g): BO.

Zoogeographical distribution. Holarctic: western Palaearctic (common), eastern Palaearctic, USA, Neotropical: Venezuela and Cuba.

Distribution in Iran. Alborz, East Azerbaijan, Fars, Guilan, Kerman, Kermanshah, Markazi, Mazandaran, and Zanjan provinces.

Genus *Graptoppia* Balogh, 1983

Subgenus *Stenoppia* Balogh, 1983

***Graptoppia* sp.**

Material examined. Dehak (b): SO.

Remarks. More specimens are needed for accurate identification.

Genus *Striatoppia* Balogh, 1958

***Striatoppia* cf. *quadrilineata* Hammer, 1982**

Material examined. Saravan (d): AL; Saravan (e): NS; Hoshak: NS.

Zoogeographical distribution. Bali.

Distribution in Iran. Sistan & Baluchestan province (**New record** for Iran).

Remarks. More specimens are needed for accurate identification.

Family Tectocepheidae Grandjean, 1954

Genus *Tectocepheus* Berlese, 1896

***Tectocepheus velatus* (Michael, 1880)**

Material examined. Kaladin (a): DP, PO, AL; Nahuk (a): PE, GV, BO; Nahuk (b): CA, GV, PO, CF, SO, DP; Shamsabad: PO, DP, WM; Gosht (a): GV, AL, PE, WM, CF; Gosht (b): GV, AL; Jaleq: AL; Kalagan (a): AL, PO, AP; Kalagan (b): DP, WM, AL, PE; Dehak (b): SO, LE, PO, SO; Sinkan (a): AL; Sinkan (b): DP, AL, PO, AL; Esfandak (a): ME, CA; Saravan (a): GV; Saravan (c): DP; Saravan (d): CF, AL; Saravan (e): CF, PO; Saravan (g): JU, BO, DP; Hoshak: WM, AL, CA, NS, AL, DP, PO; Kuhak: CF, CF, AL, DP; Murt: LE, JU; Aspich: NS, SO, DP; Ziyarat: GV, SO, CA; Gomban: GV, BO, DP; Kunardan: PI, PO; Jaleq: CF; Sirkan (b): PO.

Zoogeographical distribution. Cosmopolitan.

Distribution in Iran. Alborz, East Azerbaijan, Fars, Guilan, Hamadan, Kerman, Kermanshah, Khuzestan, Kurdistan, Markazi, Mazandaran, Razavi Khorasan, Sistan & Baluchestan, Tehran, West Azerbaijan, Yazd and Zanjan provinces.

Family Passalozetidae Grandjean, 1954

Genus *Bipassalozetes* Mihelčič, 1957

***Bipassalozetes lineolatus* (Sitnikova, 1975)**

Material examined. Esfandak (b): TA.

Zoogeographical distribution. East-central Asia.

Distribution in Iran. Yazd province.

Family Zetomotrichidae Grandjean, 1934

Genus *Zetomotrichus* Grandjean, 1934

***Zetomotrichus* sp.**

Material examined. Gomban: CO; Gosht (a): WM, TA, CF; Murt: SO; Nahuk (a): DP; Saravan (d): CF; Esfandak (a): PO; Kalagan (a): WM; Kalagan (b): GV; Ziyarat: SO, CF.

Remarks. More specimens are needed for accurate identification.

Family Oribatulidae Thor, 1929

Genus *Oribatula* Berlese, 1896

***Oribatula pallida* Banks, 1906**

Material examined. Murt: JU, LE, SO; Saravan (d): CF; Aspich: PO; Gomban: WM; Nahuk (a): GV, DP; Nahuk (b): DP, SO; Kaladin (a): PO, DP; Esfandak (a): PO; Kalpuregan: CO, JU; Gosht (b): GV; Sirkan (b): GV.

Zoogeographical distribution. Holarctic (Palaearctic: less frequent in the north and Nearctic).

Distribution in Iran. Mazandaran, Guilan, East & West Azerbaijan, Fars, Zanjan provinces.

Subgenus *Zygoribatula* Berlese, 1916

***Oribatula connexa connexa* Berlese, 1904**

Material examined. Murt: PO, LE; Hoshak: AL, PO, WM, CA, NS, DP; Gosht (a): CF, WM, LE, DP, JU, PO, GV, WM, AL, WM; Gosht (b): AL, SO, GV, NS; Sinkan (a): AL, GV, DP, CF; Sinkan (b): PO, DP, CF; Gomban: WM, DP, WM, BO, AL; Ziyarat: SO, GV; Saravan (a): CP, PO, DP, *AP*, CA, GV, WM; Saravan (d): CF, DP, AL; Saravan (e): AMA; Saravan (f): CF; Kuhak: AL, DP, CF; Nahuk (a): CF, NS; Dehak (b): LE, SO; Esfandak (a): CF, SO; Kalpuregan: AL, JU; Sirkan (b): AL, PO, DP, GV; Kunardan: PI; Aspich: PO, DP; Shamsabad: WM, GV, PO, DP.

Zoogeographical distribution. Mediterranean and Iran.

Distribution in Iran. Alborz, Ardabil, East Azerbaijan, Fars, Hamadan, Golestan, Kerman, Kermanshah, Khuzestan, Mazandaran, Razavi Khorasan, Tehran, West Azerbaijan, Yazd, and Zanjan provinces.

***Oribatula undulata* Berlese, 1916**

Material examined. Nahuk (a): CF, WM; Nahuk (b): CA, CF, PO; Sinkan (a): PO; Sinkan (b): CF, PO; Gosht (a): TA, CF, WM, LE, JU; Jaleq: CF, AL; Kalagan (a): AL; Kaladin (a): AL, DP; Kuhak: CF, DP, PO, CF; Murt: SO.

Zoogeographical distribution. Pantropical (except Neotropical) and Subtropical.

Distribution in Iran. East Azerbaijan, Fars, Guilan, Hamadan, Hormozgan, Kerman, Markazi, Mazandaran, Razavi Khorasan, Sistan & Baluchestan, Tehran, West Azerbaijan, Yazd, and Zanjan provinces.

Family Scheloribatidae Grandjean, 1933

Genus *Scheloribates* Berlese, 1908

***Scheloribates fimbriatus* Thor, 1930**

Material examined. Kuhak: DP, AL, AL, AL, DP; Nahuk (a): BO; Nahuk (b): DP, CF; Dehak (b): PE, SO; Hoshak: AL, CA, AL, WM, NS; Ziyarat: GV, CA; Murt: LE, JU; Gosht (a): LE, PO, PE; Gosht (b): GV, AL, SO; Kunardan: PO, AP; Gomban: AL, GV, DP, WM; Saravan (a): AL, CP, WM; Saravan (b): JU;

Saravan (d): CA, DP, WM; Saravan (e): NS, AMA; Saravan (f): CF, GV; Sinkan (b): DP, AL, PO, PO; Kalpuregan: CO, DP; Sirkan (a): DP; Sirkan (b): AL; Shamsabad: PO, WM; Esfandak (a): AMA; Kaladin (a): AL, CF; Esfandak (a): SO.

Zoogeographical distribution. Pantropical and Subtropical.

Distribution in Iran. East Azerbaijan, Fars, Guilan, Hormozgan Mazandaran, Kerman, Kermanshah, Khuzestan, Razavi Khorasan, West Azerbaijan, Yazd, and Zanjan provinces.

***Scheloribates pallidulus* (Koch, 1841)**

Material examined. Nahuk (b): CF; Kunardan: CO; Kaladin (a): DP, DP.

Zoogeographical distribution. Cosmopolitan (except Antarctic).

Distribution in Iran. East Azarbaijan province.

***Scheloribates praeincisus* (Berlese, 1910)**

Material examined. Kalagan (a): PO, WM; Kalagan (b): DP, PE; Saravan (b): JU, SO; Saravan (d): CF, CA; Saravan (e): NS, PO, CF; Saravan (f): GV, CF; Saravan (g): JU; Murt: PO, LE, NS; Kuhak: CF, CF, DP; Hoshak: CA, NS, PO; Nahuk (b): SO, DP; Kaladin (a): DP, DP, AL; Gosht (a): GV; Kalpuregan: SO; Aspich: NS.

Zoogeographical distribution. Pantropical and Subtropical.

Distribution in Iran. East Azerbaijan, Fars, Guilan, Hormozgan, Kerman, Mazandaran, Yazd and Zanjan provinces.

***Scheloribates praelineatus* Hammer, 1977**

Material examined. Murt: NS.

Zoogeographical distribution. India (Tripura) and Pakistan.

Distribution in Iran. Sistan & Baluchestan province (**New record** for Iran).

Family Protoribatidae J. & P. Balogh, 1984

Genus *Protoribates* Berlese, 1908

***Protoribates paracapucinus* (Mahunka, 1988)**

Material examined. Saravan (a): CA; Saravan (f): GV, CF; Kuhak: CF, AL, DP; Nahuk (b): DP; Hoshak: AL, NS, AL; Gosht (a): PE; Kaladin (a): DP; Aspich: NS; Jaleq: SO.

Zoogeographical distribution. Subtropical: eastern Palaearctic (Iran); Tropical: Paleotropical, Neotropical, and Australian.

Distribution in Iran. Alborz, East Azerbaijan, Fars, Guilan, Kerman, Kermanshah, Kurdistan, Lorestan, Markazi, Mazandaran, Razavi Khorasan, Sistan & Baluchestan Tehran, West Azerbaijan, Yazd, and Zanjan provinces.

Family Haplozetidae Grandjean, 1936

Genus *Baloghiella* Bulanova-Zachvatkina, 1972

***Baloghiella granulata* Bayartogtokh & Akrami, 2000**

Material examined. Saravan (e): AMA.

Zoogeographical distribution. Iran.

Distribution in Iran. East Azerbaijan, Fars, Razavi Khorasan, and Yazd provinces.

Genus *Rostrozetes* Sellnick, 1925

***Rostrozetes ovulum ovulum* (Berlese, 1908)**

Material examined. Saravan (e): NS.

Zoogeographical distribution. Pantropical and Subtropical.

Distribution in Iran. Sistan & Baluchestan province (**New record** for Iran).

Family Oribatellidae Jacot, 1925

Genus *Lamellobates* Hammer 1958

Subgenus *Paralamellobates* Bhaduri & Raychaudhuri, 1968

***Lamellobates* (*Paralamellobates*) *misella* (Berlese, 1910)**

Material examined. Murt: NS; Kalagan (b): PE; Sinkan (b): DP.

Zoogeographical distribution. Pantropical and southern Palaearctic.

Distribution in Iran. Sistan & Baluchestan province (**New subgeneric record** for Iran).

Family Galumnidae Jacot, 1925

Genus *Galumna* Heyden, 1826

***Galumna karajica* Mahunka & Akrami, 2001**

Material examined. Sirkan (b): GV; Sinkan (a): PO; Gosht (a): CF, PO, PE.

Zoogeographical distribution. Caucasus and Iran.

Distribution in Iran. Alborz, East Azerbaijan, Fars, Kerman, Markazi, Mazandaran, Razavi Khorasan, West Azerbaijan, Yazd, and Zanjan provinces.

***Galumna flabellifera* Hammer, 1958**

Material examined. Nahuk (b): CF; Sirkan (a): DP.

Zoogeographical distribution. Pantropical and Subtropical.

Distribution in Iran. Alborz, Fars, Kerman, Kermanshah, and Yazd provinces.

Genus *Leptogalumna* Balogh, 1960

***Leptogalumna* sp.**

Material examined. Saravan (g): BO; Kalagan (b): WM; Kalpuregan: DP.

Distribution in Iran. Sistan & Baluchestan province (**New subgeneric record** for Iran).

Remarks. More specimens are needed for accurate identification.

Genus *Pergalumna* Grandjean, 1936

***Pergalumna sistanbaluchestanica* Akrami, 2021**

Material examined. Kalpuregan: DP, CO, AL; Sirkan: PO.

Zoogeographical distribution. Iran.

Distribution in Iran. Sistan & Baluchestan province.

Genus *Pilogalumna* Grandjean, 1956

***Pilogalumna tenuiclava* (Berlese, 1908)**

Material examined. Saravan (a): WM; Dehak (b): PE; Sirkan, PO; Ziyarat: GV; Murt: PO; Saravan: CA; Nahuk (b): CF.

Zoogeographical distribution. Holarctic and Mexico.

Distribution in Iran. East Azerbaijan, Fars, Kerman, Markazi, Yazd, and Zanjan provinces.

DISCUSSION

In total, 40 species from 30 genera and 18 families were collected from Saravan and Gulshan counties, Sistan & Baluchestan province. Among them, genera *Hoplophorella* and *Javacarus*, subgenera *Paralamellobates* and *Leptogalumna*, and seven species *Acrotritia rustica* Niedbała, 1991, *Hoplophorella vitrina* (Berlese, 1913), *Javacarus foliatus* Hammer, 1972, *Lamellobates misella* (Berlese, 1910), *Rostrozetes ovulum ovulum* (Berlese, 1908), *Scheloribates praelineatus* Hammer, 1977, and *Striatoppia* cf. *quadrilineata* Hammer, 1982 are represented as new records for mite fauna of Iran, all species are recorded for the first time from Saravan and Gulshan counties. Based on our results, Oppiidae (with seven species), Galumnidae (five species), Scheloribatidae and Euphthiracaridae (each with four species), and *Acrotritia* and *Scheloribates* (each with four species), *Oribatula* (three species) are the families and genera with the highest number of species. Of these 40 species, seven species have a Tropical (Pantropical and Subtropical) distribution, six species are distributed in the Palaearctic, 15 are semi-cosmopolitan and cosmopolitan, and three species are known only from Iran. In this study, some rare species, such as *Scheloribates* (*S.*) *praelineatus* and *Striatoppia* cf. *quadrilineata*, previously known only from Pakistan, India, and Bali, are now recorded for the first time from Iran.

Among the oribatid mites collected from Saravan and Gulshan counties, five following species have previously been reported as intermediate hosts of anoplocephalid tapeworms from other parts of Iran and the world: *Scheloribates fimbriatus* Thor, 1930, *Scheloribates praeincisus* (Berlese, 1910), *Galumna karajica* Mahunka & Akrami, 2001, *Pilogalumna tenuiclava* (Berlese, 1908) and *Oribatula* (*Z.*) *undulata* Berlese, 1916 (Graber & Gruvel, 1967, 1969; Nazarova, 1970; Narsapur, 1974, 1976; Barutzki & Sabzeh Parwar, 1986; Xiao & Herd, 1992; Denegri, 1993; Schuster et al., 2000; McAloon, 2004; Akrami et al., 2007). Although our results contribute to the enrichment of knowledge of the regional mite fauna, our knowledge on the diversity and distribution of oribatid mites of Sistan & Baluchestan and most Iranian provinces is still in the initial stages of investigation, and much more work is needed to understand of the total diversity of Iranian oribatid mites.

AUTHOR'S CONTRIBUTION

The authors confirm their contribution in the paper as follows: Y. Arbab: Collecting, preparation and preliminary sorting of the material; M.A. Akrami: identification of specimens, writing and revising the manuscript. Both authors participated in writing the paper The authors read and approved the final version of the manuscript.

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AVAILABILITY OF DATA AND MATERIAL

The specimens listed in this study are deposited in the Acarological collection of the Department of Plant Protection, School of Agriculture, Shiraz University, Shiraz, Iran, and are available from the curator upon request.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

CONSENT FOR PUBLICATION

Not applicable.

CONFLICT OF INTERESTS

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

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کنه‌های اریباتید (Acari, Sarcoptiformes) استان سیستان و بلوچستان ایران، همراه با گزارش‌های جدید

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چکیده: به منظور بررسی فون کنه‌های اریباتید (Oribatida) در استان سیستان و بلوچستان (جنوب‌شرق ایران)، نمونه‌های خاک و لاشبرگ در شهرستان‌های سراوان و گلشن طی اسفند ۱۳۹۹ تا شهریور ۱۴۰۰ جمع‌آوری شد. در مجموع ۴۰ گونه متعلق به ۳۰ جنس از ۱۸ خانواده جمع‌آوری و شناسایی شد، که در بین آنها جنس‌های *Hoplophorella*، *Javacarus*، زیرجنس‌های *Leptogalumna*، *Paralamellobates* و هفت گونه شامل *Acrotritia rustica* Niedbała, 1991، *Hoplophorella vitrina* (Berlese, 1913)، *Javacarus foliatus* Hammer, 1972، *Lamellobates misella* (Berlese, 1910)، *Rostrozetes ovulum ovulum* (Berlese, 1908)، *Striatoppia* cf. *quadrilineata* Hammer, 1982 و *Scheloribates praelineatus* Hammer, 1977 برای اولین بار از ایران ثبت شدند.

واژگان کلیدی: پراکنش، شرق ایران، فون، کنه‌های خزه، زیست‌شناسی خاک