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A survey on bees (Insecta, Hymenoptera, Apoidea) and their associated mites in Chaharmahal and Bakhtiari province of Iran

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ABSTRACT. In this study 46 species of bees (Hymenoptera: Apoidea) and their 17 associated mite species from Chaharmahal and Bakhtiari province reigns with some specimens collected from Yasouj and Dezful have been examined. Four species of mites were new for Iran: *Sennertia zhelochovtsevi* Zachvatkin, *Vidia lineata* Oudemans, *Sennertionyx manicati* (Giard) and *Crabrovidia oudemansi* Fain. These mites were found on bees' families of Halictidae, Megachilidae, Apidae and Andrenidae. The identified mites were belonging to families of Neopygmephoridae, Scutacaridae, Chaetodactylidae, Anotidae, Acaridae, Saproglyphidae and Winterschmidtidae. Among bees' families, the most association was observed on Halictidae and the lowest was on Andrenidae. Bee species of *Halictus* (*Halictus*) *resurgens* Nurse, 1903 had the highest percentage of association. All specimens are deposited in the Iranian Pollinator Insects Museum of Yasouj University. Herein a list of mite species associated with bees and bees' species list are provided. Some specimens belong to genera of *Imparipes* Berlese, 1903 (n=12 specimens) and *Chaetodactylus* Rondani, 1866 (n=11 specimens) were new for science which would be described in a subsequent paper.

Key words: Apoidea, mites, Iran, pollinator bees

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Introduction

Bees and their relationships with other organisms have been important for human from ancient. It is clear that pollinating of flowering plants would ensure fruit formation, survival, and plant diversity. Pollinators are the most important factors for keeping plant diversity in protecting plant species in nature and increasing the

productivity of human products, including many fruits and vegetables. Among pollinator animals, bees belong to superfamily Apoidea have the most important role in the pollination of various plants, especially plants which supply nutritional needs of human and domestic animals. There are approximately 20,000

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bees species worldwide, with the greatest diversity found in xeric regions. The living bees are segregated into seven families Colletidae, Halictidae, Stenotritidae, Andrenidae, Melittidae, Megachilidae and Apidae (Michener, 2007). Among these families, Stenotritidae, restricted to Australia. In Iran, like to other countries, most species of Apoidea are wild and always live in mountainous regions (Monfared et al., 2007). Bees of superfamily Apoidea, like most insects, are rich in dietary diversity. In addition to their paramount role in pollination of flowering plant, these bees have a large biological connection with many living organisms. Mites are one of the most important limiting factors of the population of bees if they have a parasitic role. Some of other mites, particularly group Heterostigmata known as phoretic mites (Klimov et al., 2007). This relationship is a kind of symbiosis or parasitic and is divided into two groups of phoretic mites and parasite mites according to the type of life and behavior of the bees (Klimov et al., 2007). For example the mites of the Chaetodactylidae family are extensively present on bees, especially on Megachilidae bees, and in some cases serious injuries have been reported by these mites to managed colonies (Klimov & O'Connor, 2004). Mites of the genus *Parapygmephorus* Cross, 1965 (Acari; Heterostigmata; Neopygmephoridae) are associated with different Halictid bees (Hymenoptera: Halictidae) in the Holarctic (Hajiqanbar et al., 2011). There is not a comprehension study about mite associated with bees in Iran. The main purpose of this study was finding and identifying of mite species associated with bees' superfamily Apoidea of Chaharmahal and Bakhtiari. Also we added information we found about these mite from Yasouj and Dezful bees which was available in our museum in Yasouj University.

Material and methods

In this survey, we collected 1220 pollinator bees from Chaharmahal and Bakhtiari province (various cities), Yasouj (a city in Kohgiluyeh and Boyerahmad Province) and Dezful (a city in Khuzestan Province). All bees were examined for associated mites. Among these, 148 bees were associated with mites. Sampling was begun at the beginning of flowering of the plants during 2016 and 2017. Sampling locations were recorded by Garmin eTrix Hc GPS. At the time of sampling, collected bees were stored in 70% alcohol-containing tubs and transferred to the lab. Mites were separated from bee body by a fine brush under a Nikon SMZ745T stereomicroscope, cleared in Nesbitt's fluid and mounted in Faure medium. Mites identifications carried out by P. Klimov (Michigan University, USA), and H. Hajiqanbar (Tarbiat Modares University, Iran). Bees identified by second author (AM). All identified species were deposited in the "Iranian pollinator Insects Museum of Yasouj University" located in Plant Protection Department at the Faculty of Agriculture, Yasouj University, Yasouj, Iran (IPIM-YU). Number of associated mites for Trombidiformes, Acariformes and Sarcoptiformes in this study shown in Table 2 and Table 3.

Results

From 46 species of bees (Hymenoptera: Apoidea) which were examined (Table 1) collectively 17 associated mite species have been found. Among the bees, there were nine species of Apidae, 21 species of Halictidae, 15 species of Megachilidae and One species of Andrenidae. The mites found on bees families of Halictidae, Megachilidae, Apidae and Andrenidae. Additionally, the presence of two new species of mites, genera *Imparipes* and *Chaetodactylus*, were detected; these are currently undergoing descriptive study. *Halictus* (*Halictus*) *resurgens* had the highest

percentage of association. Bee families and associated mites accounts come as follow:

Family Halictidae

Subfamily: Nomiinae

Pseudapis (Pseudapis) diversipes (Latreille, 1806)

Material examined: Chaharmahal and Bakhtiari province, Ardal, Rostamabad (31°59'59" N, 50°39'42" E) 1388m, 4.VI.2016, 2♀♀; Shahrekord, Nafch (32°24'49.63" N, 50°38'20.84" E) 2230m, 2.VIII.2016, 4♀♀, 20.IX.2016, 4♀♀, 2♂♂, 23.IX.2016, 6♀♀, 4♂♂; Shahrekord, Asadabad (32°24'49.63" N, 50°38'20.84" E) 2227.20m, 5.X.2016, 7♀♀, 2♂♂, pinned (IPIM-YU).

General distribution: Europe (Pauly, 2007), North Africa (Astafurova & Pesenko, 2006), Middle East to central Asia and Pakistan (Özbek, 1979) and Turkey (Dickmen & Çağatay, 2007).

Host plant associations: *Medicago* sp. (Fabaceae), *Mentha* sp. (Lamiaceae), *Astragalus* sp. (Fabaceae).

Mite association: *Anoetus szelenyii* (Anoetidae).

Pseudapis (Pseudapis) lobata (Olivier, 1812)

Material examined: Chaharmahal and Bakhtiari province, Shahrekord, Asadabad (32°22'41.46" N, 50°35'36.62" E), 2227.20m, 22.VIII.2016, 1♀, 2♂♂, 5.X.2016, 2♀♀, pinned (IPIM-YU).

General distribution: Turkmenistan (Astafurova & Pesenko, 2006), Turkey and Iran (Ascher & Pickering, 2016).

Host plant associations: *Medicago* sp. (Fabaceae), *Mentha* sp. (Lamiaceae).

Pseudapis (Pseudapis) bispinosa (Brullé, 1832)

Material examined: Chaharmahal and Bakhtiari province, Shahrekord, Asadabad (32°22'41.46" N, 50°35'36.62" E), 2227.20m, 22.VIII.2016, 2♀♀, 5.X.2016, 2♀♀, pinned (IPIM-YU).

General distribution: Europe (Pauly, 2007), North Africa (Astafurova & Pesenko, 2006), Middle East to central Asia and Pakistan (Özbek, 1979), Turkey (Dickmen & Çağatay, 2007).

Host plant associations: *Medicago* sp. (Fabaceae), *Mentha* sp. (Lamiaceae).

Mite association: *Anoetus szelenyii* (Anoetidae).

Pseudapis (Pseudapis) platula (Warncke, 1976)

Material examined: Chaharmahal and Bakhtiari province, Kuhrang, Dimeh (32°26'12.35" N, 50°09'24.22" E), 2228m, 29.V.2016, 1♀; Shahrekord, Nafch (32°24'49.63" N, 50°38'20.84" E), 2230m, 23.IX.2016, 1♂; Shahrekord, Asadabad (32°22'41.46" N, 50°35'36.62" E), 2227.20m, 5.X.2016, 1♂, pinned (IPIM-YU).

General distribution: Tajikistan and Iran (Astafurova & Pesenko, 2006).

Host plant associations: *Astragalus* sp. (Fabaceae).

Mite association: *Anoetus szelenyii* (Anoetidae).

Subfamily: Halictinae

Lasioglossum (Evyllaesus) mesosclerum (Pérez, 1903)

Material examined: Chaharmahal and Bakhtiari province, Shahrekord, Asadabad (32°22'41.46" N, 50°35'36.62" E), 2227.20m, 5.X.2016, 1♀, pinned (IPIM-YU).

General distribution: Europe to Eastern Asia and North Africa (Ebmer, 1978; Pesenko, 2005).

Host plant associations: *Astragalus* sp. (Fabaceae).

Mite association: *Anoetus* sp.1 (Anoetidae).

Lasioglossum (Evyllaesus) interruptum (Panzer, 1798)

Material examined: Chaharmahal and Bakhtiari province, Ardal, Rostamabad (31°59'59"N, 50°39'42"E), 1388m, 4.VI.2016, 1♀; Shahrekord, Teshniz (32°05'20.43" N,

50°47'08.96" E), 2055m, 21.IV.2017, 1♀, pinned (IPIM-YU).

General distribution: Europe to western Asia, Northern Africa (Ebmer, 1978; Pesenko, 2005).

Host plant associations: *Mentha* sp. (Lamiaceae), *Astragalus* sp. (Fabaceae).

Lasioglossum (Evylaeus) pauxillum (Schenk, 1853)

Material examined: Chaharmahal and Bakhtiari province, Shahrekord, Asadabad (32°22'41.46" N, 50°35'36.62" E), 2227.20m, 22.VIII.2016, 1♀, pinned (IPIM-YU).

General distribution: Europe (Pauly, 2007), Russia and Middle East to central Asia (Pesenko, 2005).

Host plant associations: *Medicago* sp. (Fabaceae).

Lasioglossum (Evylaeus) marginatum (Brullé, 1832)

Material examined: Chaharmahal and Bakhtiari province, Shahrekord, Teshniz (32°05'20.43" N, 50°47'08.96" E), 2055m, 21.IV.2017, 1♀, pinned (IPIM-YU).

General distribution: Europe to Western Asia (Pauly, 2007; Pesenko, 2005).

Host plant associations: *Astragalus* sp. (Fabaceae).

Lasioglossum (Evylaeus) pseudoleptorhynchum (Blüthgen, 1931)

Material examined: Chaharmahal and Bakhtiari province, Shahrekord, Asadabad (32°22'41.46" N, 50°35'36.62" E), 2227.20m, 19.VIII.2016, 1♀, pinned (IPIM-YU).

General distribution: Iran, Afghanistan and Pakistan (Ascher & Pickering, 2016).

Host plant associations: *Medicago* sp. (Fabaceae).

Lasioglossum (Evylaeus) nigripes (Lepeletier, 1841)

Material examined: Chaharmahal and Bakhtiari province, Shahrekord, Asadabad

(32°22'41.46" N, 50°35'36.62" E), 2227.20m, 19.VIII.2016, 1♀, pinned (IPIM-YU).

General distribution: Palaearctic (Polaszek, 2004), Turkey (Özbek, 1979).

Host plant associations: *Medicago* sp. (Fabaceae).

Halictus (Halictus) resurgens Nurse, 1903

Material examined: Chaharmahal and Bakhtiari province, Shahrekord, Nafch (32°24'49.63" N, 50°38'20.84" E), 2230m, 2.V.2016, 1♀, 2.VIII.2016, 7♀♀, 4♂♂, 20.IX.2016, 4♀♀, 4♂♂, 23.IX.2016, 4♀♀, 7♂♂, Kuhrang, Dimeh (32°26'12.35" N, 50°09'24.22" E), 2228m, 29.V.2016, 7♀♀; Ardal, Rostamabad (31°59'59"N, 50°39'42"E), 1388m, 4.VI.2016, 1♀; Shahrekord, Asadabad (32°22'41.46" N, 50°35'36.62" E), 2227.20m, 19.VIII.2016, 35♀♀, 10♂♂, 22.VIII.2016, 43♀♀, 5.X.2016, 2♀♀, pinned (IPIM-YU).

General distribution: Northeast Africa to Central Asia (Pesenko, 2005).

Host plant associations: *Medicago* sp. (Fabaceae), *Mentha* sp. (Lamiaceae), *Astragalus* sp. (Fabaceae).

Mite association: *Anoetus* sp.2, *Anoetus* sp.3 (Anoetidae); *Crabrovidia oudemansi* (Saproglyphidae); *Parapygmephorus crossi*, *Parapygmephorus khorasanicus*, *Parapygmephorus delyorum* (Neopygmephoridae).

Halictus (Halictus) brunnescens (Eversmann, 1852)

Material examined: Chaharmahal and Bakhtiari province, Shahrekord, Asadabad (32°22'41.46" N, 50°35'36.62" E), 2227.20m, 19.VIII.2016, 1♀, 1♂, 22.VIII.2016, 1♀, 5♂♂, 23.IX.2016, 2♀♀, 5.X.2016, 1♂, pinned (IPIM-YU).

General distribution: Europe to Central Asia, Northern China and Northern India (Pesenko, 2005).

Host plant associations: *Medicago* sp. (Fabaceae).

Mite association: *Anoetus* sp.2, *Anoetus* sp.3 (Anoetidae).

***Halictus (Halictus) maculatus* Smith, 1848**

Material examined: Chaharmahal and Bakhtiari province, Kuhrang, Dimeh (32°26'12.35" N, 50°09'24.22" E), 2228m, 29.V.2016, 1♀, pinned (IPIM-YU).

General distribution: Europe to Central Asia (Pesenko, 2005).

Host plant associations: *Astragalus* sp. (Fabaceae).

***Halictus (Halictus) patellatus* Morawitz, 1874**

Material examined: Chaharmahal and Bakhtiari province, Kuhrang, Dimeh (32°26'12.35" N, 50°09'24.22" E), 2228m, 29.V.2016, 1♀; Shahrekord, Asadabad (32°22'41.46" N, 50°35'36.62" E), 2227.20m, 5.X.2016, 1♀, pinned (IPIM-YU).

General distribution: Europe (Pauly, 2007), North Africa (Astafurova & Pesenko, 2006), Middle East to central Asia and Turkmenistan (Özbek, 1979).

Host plant associations: *Medicago* sp. (Fabaceae), *Astragalus* sp. (Fabaceae).

Mite association: *Parapygmephorus crossi* (Neopygmephoridae), *Parapygmephorus khorasanicus* (Neopygmephoridae).

***Halictus (Halictus) submodernus* Blüthgen, 1936**

Material examined: Chaharmahal and Bakhtiari province, Shahrekord, Asadabad (32°22'41.46" N, 50°35'36.62" E), 2227.20m, 5.X.2016, 1♀, pinned (IPIM-YU).

General distribution: Iran and Turkey (Ascher & Pickering, 2016).

Host plant associations: *Medicago* sp. (Fabaceae).

***Halictus (Selodonia) smaragdulus* Vachal, 1895**

Material examined: Chaharmahal and Bakhtiari province, Kuhrang, Dimeh (32°26'12.35" N, 50°09'24.22" E), 2228m, 29.V.2016, 1♀; Shahrekord, Asadabad

(32°22'41.46" N, 50°35'36.62" E), 2227m, 5.X.2016, 12♀♀, pinned (IPIM-YU).

General distribution: Western Europe (Pauly, 2007), Turkey and Iran.

Host plant associations: *Astragalus* sp. (Fabaceae), *Medicago* sp. (Fabaceae).

***Halictus (Selodonia) cephalicus* Morawitz, 1874**

Material examined: Chaharmahal and Bakhtiari province, Shahrekord, Asadabad (32°22'41.46" N, 50°35'36.62" E), 2227.20m, 5.X.2016, 2♀♀, pinned (IPIM-YU).

General distribution: Turkey, Iran and Afghanistan (Dickmen & Çağatay, 2007).

Host plant associations: *Medicago* sp. (Fabaceae).

***Halictus (Vestitohalictus) pollinosus* Sichel, 1860**

Material examined: Chaharmahal and Bakhtiari province, Shahrekord, Asadabad (32°22'41.46" N, 50°35'36.62" E), 2227.20m, 19.VIII.2016, 1♀, pinned (IPIM-YU).

General distribution: Europe to central Asia, North Africa, China, Kyrgyzstan (Ascher & Pickering, 2016).

Host plant associations: *Medicago* sp. (Fabaceae).

***Halictus (Vestitohalictus) tuberculatus* Blüthgen, 1925**

Material examined: Chaharmahal and Bakhtiari province, Shahrekord, Asadabad (32°22'41.46" N, 50°35'36.62" E), 2227.20m, 19.VIII.2016, 1♀, pinned (IPIM-YU).

General distribution: Ukraine, Near East (Polaszek, 2004) and Turkey (Warncke, 1975).

Host plant associations: *Medicago* sp. (Fabaceae).

Halictus (Thrincohalictus) sp.

Material examined: Chaharmahal and Bakhtiari province, Shahrekord, Asadabad

(32°22'41.46" N, 50°35'36.62" E), 2227.20m, 22.VIII.2016, 1♀, pinned (IPIM-YU).

Host plant associations: *Medicago* sp. (Fabaceae).

Sphecodes (Sphecodes) puncticeps Thomson, 1870

Material examined: Chaharmahal and Bakhtiari province, Shahrekord, Asadabad (32°22'41.46" N, 50°35'36.62" E), 2227.20m, 22.VIII.2016, 1♂, pinned (IPIM-YU).

General distribution: Europe to Middle East, North Africa and Russia (Ascher & Pickering, 2016)

Host plant associations: *Medicago* sp. (Fabaceae).

Family Megachilidae

Subfamily: Megachilinae

Megachile (Megachile) centuncularis (Linnaeus, 1758)

Material examined: Chaharmahal and Bakhtiari province, Ardal, Rostamabad (31°59'59"N, 50°39'42"E), 1388m, 4.VI.2016, 1♀; Kohgiluyeh and Boyer-Ahmad province, Yasouj (30°39'06.53" N, 51°35'26.5" E), 1817.52m, 20.VIII.2016, 2♀♀, pinned (IPIM-YU).

General distribution: Europe to Middle East (Pauly, 2007; Peters, 1972).

Host plant associations: *Astragalus* sp. (Fabaceae).

Mite association: *Vidia* sp.1 (Winter-schmidtidae); *Sancassania* sp. (Acaridae).

Megachile (Pseudomegachile) saussurei Radoszkowski, 1874

Material examined: Chaharmahal and Bakhtiari province, Shahrekord, Nafch (32°24'49.63" N, 50°38'20.84" E), 2230m, 4.VI.2016, 1♀, 2.VIII.2016, 1♀, 20.IX.2016, 2♀♀, 23.IX.2016, 1♀; Shahrekord, Asadabad (32°22'41.46" N, 50°35'36.62" E), 2227.20m, 5.X.2016, 17♀♀, pinned (IPIM-YU).

General distribution: Central Asia (Pesenko, 2005).

Host plant associations: *Medicago* sp. (Fabaceae), *Mentha* sp. (Lamiaceae).

Megachile (Pseudomegachile) farinosa Smith, 1853

Material examined: Chaharmahal and Bakhtiari province, Shahrekord, Asadabad (32°22'41.46" N, 50°35'36.62" E), 2227.20m, 5.X.2016, 2♀♀, pinned (IPIM-YU).

General distribution: Egypt, Iraq and Turkey (Grace, 2010; Ascher & Pickering, 2016).

Host plant associations: *Mentha* sp. (Lamiaceae)

Megachile (Pseudomegachile) ericetorum Lepeletier, 1841

Material examined: Chaharmahal and Bakhtiari province, Shahrekord, Asadabad (32°22'41.46" N, 50°35'36.62" E), 2227.20m, 5.X.2016, 1♀, pinned (IPIM-YU).

General distribution: Europe to Central Asia (Ascher & Pickering, 2016).

Host plant associations: *Mentha* sp. (Lamiaceae).

Megachile (Eutricharaea) anatolica Rebmann, 1968

Material examined: Chaharmahal and Bakhtiari province, Shahrekord, Nafch (32°24'49.63" N, 50°38'20.84" E), 2230m, 2.VIII.2016, 1♀, 20.IX.2016, 1♀; Kohgiluyeh and Boyer-Ahmad province, Yasouj (30°39'06.53" N, 51°35'26.5" E), 1817.52m, 24.V.2017, 1♀, pinned (IPIM-YU).

General distribution: Greece and Turkey (Grace, 2010).

Host plant associations: *Medicago* sp. (Fabaceae).

Mite association: *Vidia* sp.2 (Winter-schmidtidae).

Megachile (Eutricharaea) pilidens Alfken, 1924

Material examined: Chaharmahal and Bakhtiari province, Shahrekord, Nafch

(32°24'49.63" N, 50°38'20.84" E), 2230m, 20.IX.2016, 1♀, 23.IX.2016, 1♀, pinned (IPIM-YU).

General distribution: Russia, Kazakhstan, Libya, Egypt, Georgia, Turkey and Eastern and Southern Europe (Ascher & Pickering, 2016).

Host plant associations: *Medicago* sp. (Fabaceae).

Mite association: *Vidia* sp.1 (Winterschmidtiidae).

Megachile (Eutricharaea) rotundata (Fabricius, 1787)

Material examined: Chaharmahal and Bakhtiari province, Shahrekord, Nafch (32°24'49.63" N, 50°38'20.84" E), 2230m, 20.IX.2016, 1♀, Shahrekord, Asadabad (32°22'41.46" N, 50°35'36.62" E), 2227.20m, 5.X.2016, 2♀♀, pinned (IPIM-YU).

General distribution: Cyprus, Europe, Greece, North Africa, Southern and Eastern America, and Turkey (Özbek & Zanden, 1994; Banaszak & Romasenko, 1998; Amiet et al., 2004; Ornos et al., 2007; Ban-Calefariu, 2009; Grace, 2010).

Host plant associations: *Medicago* sp. (Fabaceae), *Mentha* sp. (Lamiaceae).

Megachile (Eutricharaea) apicalis Spinola, 1808

Material examined: Chaharmahal and Bakhtiari province, Rostamabad, Ardal (31°59'59" N, 50°39'42" E), 1388m, 4.VL.2016, 4♂♂, Shahrekord, Asadabad (32°22'41.46" N, 50°35'36.62" E), 2227.20m, 2.VIII.2016, 2♂♂, 19.VIII.2016, 1♂, 22.VIII.2016, 1♂, 5.X.2016, 1♂.

General distribution: Canada, Cyprus, Greece, North Africa, Palestine, Turkey (Özbek & Zanden, 1994; Banaszak & Romasenko, 1998; Amiet et al., 2004; Ornos et al., 2007; Ban-Calefariu, 2009; Grace, 2010), Iran, Russia, Uzbekistan, Pakistan, Tajikistan and Europe (Ascher & Pickering, 2016).

Host plant associations: *Medicago* sp. (Fabaceae), *Astragalus* sp. (Fabaceae), *Mentha* sp. (Lamiaceae).

Megachile (Eutricharaea) leachella Curtis, 1828

Material examined: Chaharmahal and Bakhtiari province, Shahrekord, Asadabad (32°22'41.46" N, 50°35'36.62" E), 2227.20m, 5.X.2016, 7♂♂, Shahrekord, Teshniz (32°05'20.43" N, 50°47'08.96" E), 2055m, 21.IV.2017, 1♂, pinned (IPIM-YU).

General distribution: Europe (Özbek & Zanden, 1994; Banaszak & Romasenko, 1998; Ornos et al., 2007; Ban-Calefariu, 2009; Grace, 2010).

Host plant associations: *Astragalus* sp. (Fabaceae), *Mentha* sp. (Lamiaceae).

Megachile (Creightonella) albisecta (Klug, 1817)

Material examined: Kohgiluyeh and Boyer-Ahmad province, Yasouj (30°39'06.53" N, 51°35'26.5" E), 1817.52m, 15.VI.2017, 4♀♀, 3♂♂, pinned (IPIM-YU).

General distribution: Russia (*NC, CR), W, E and S Europe, N Africa, Azerbaijan, Turkey, Cyprus, Syria, Israel, Iran, Turkmenistan, Uzbekistan, Kyrgyzstan (Ascher & Pickering, 2016).

Host plant associations: *Medicago* sp. (Fabaceae), *Astragalus* sp. (Fabaceae).

Mite association: *Vidia lineata* (Winterschmidtiidae).

Megachile (Creightonella) sp.

Material examined: Chaharmahal and Bakhtiari province, Shahrekord, Nafch (32°24'49.63" N, 50°38'20.84" E), 2230m, 20.IX.2016, 1♂.

Host plant associations: *Medicago* sp. (Fabaceae).

Magachile (Pseudomegachile) sp.

Material examined: Chaharmahal and Bakhtiari province, Kuhrang, Dimeh

(32°26'12.35" N, 50°09'24.22" E), 2228m, 29.V.2016, 1♂.

Host plant associations: *Astragalus* sp. (Fabaceae).

Megachile sp.

Material examined: Chaharmahal and Bakhtiari province, Shahrekord, Nafch (32°24'49.63" N, 50°38'20.84" E), 2230m, 20.IX.2016, 1♀, 23.IX.2016, 1♀, 1♂, Shahrekord, Asadabad (32°22'41.46" N, 50°35'36.62" E), 2227.20m, 5.X.2016, 2♀♀, 1♂, pinned (IPIM-YU).

Host plant associations: *Medicago* sp. (Fabaceae), *Mentha* sp. (Lamiaceae).

Anthidium (*Anthidium*) *taeniatum*
Latreille, 1809

Material examined: Kohgiluyeh and Boyer-Ahmad province, Yasouj (30°39'06.53" N, 51°35'26.5" E), 1817.52m, 16.VI.2017, 1♀, pinned (IPIM-YU).

General distribution: Algeria, Spain, Tunisia, France, Croatia, Greece, Iran, Israel and Turkmenistan (Ascher & Pickering, 2016).

Host plant associations: *Astragalus* sp. (Fabaceae).

Mite association: *Sennertionyx manicati* (Acaridae).

Subfamily: Lithurginae

Lithurgus (*Lithurgus*) *chrysurus* Fonscolombe,
1834

Material examined: Chaharmahal and Bakhtiari province, Shahrekord, Nafch (32°24'49.63" N, 50°38'20.84" E), 2230m, 20.IX.2016, 1♀; Kohgiluyeh and Boyer-Ahmad province, Yasouj (30°39'06.53" N, 51°35'26.5" E), 1817.52m, 16.VI.2017, 3♀♀, pinned (IPIM-YU).

General distribution: USA, Iran, European Russia, Morocco and Europe (Ascher & Pickering, 2016).

Host plant associations: *Medicago* sp. (Fabaceae).

Mite association: *Sennertia nr.zhelochovtsevi* (Chaetodactylidae), *Chaetodactylus* sp. (Chaetodactylidae).

Family: Apidae

Subfamily: Xylocopinae

Xylocopa (*Xylocopa*) *violacea* (Linnaeus,
1758)

Material examined: Chaharmahal and Bakhtiari province, Shahrekord, Kuhrang, Dimeh (32°26'12.35" N, 50°09'24.22" E), 2228m, 29.V.2016, 3♂♂, pinned (IPIM-YU).

General distribution: Central Asia, Eastern and Southern Europe (Ascher & Pickering, 2016).

Host plant associations: *Astragalus* sp. (Fabaceae).

Xylocopa (*Xylocopa*) *varentzowi*
Morawitz, 1894

Material examined: Chaharmahal and Bakhtiari province, Kuhrang, Dimeh (32°26'12.35" N, 50°09'24.22" E), 2228m, 29.V.2016, 1♂, pinned (IPIM-YU).

General distribution: Central Asia (Ascher & Pickering, 2016).

Host plant associations: *Astragalus* sp. (Fabaceae).

Mite association: *Sennertia* (*Sennertia*) *cerambycina*, *Chaetodactylus* sp. (Chaetodactylidae).

Xylocopa (*Proxylocopa*) *olivieri*
Lepeletier, 1841

Material examined: Chaharmahal and Bakhtiari province, Shahrekord, Teshniz (32°05'20.43" N, 50°47'08.96" E), 2055m, 23.IV.2017, 2♂♂, pinned (IPIM-YU).

General distribution: Western Asia (Ascher & Pickering, 2016).

Host plant associations: *Astragalus* sp. (Fabaceae).

Mite association: *Sennertia nr.zhelochovtsevi* (Chaetodactylidae).

***Xylocopa (Proxylocopa) rufa* Friese, 1901**

Material examined: Chaharmahal and Bakhtiari province, Kuhrang, Dimeh (32°26'12.35" N, 50°09'24.22" E), 2228m, 29.V.2016, 1♂, pinned (IPIM-YU).

General distribution: Central Asia ([Ascher & Pickering, 2016](#)).

Host plant associations: *Astragalus* sp. (Fabaceae).

***Ceratina* sp.**

Material examined: Chaharmahal and Bakhtiari province, Shahrekord, Nafch (32°24'49.63" N, 50°38'20.84" E), 2230m, 2.VIII.2016, 1♂, pinned (IPIM-YU).

Host plant associations: *Medicago* sp. (Fabaceae).

Subfamily: Apinae***Eucera (Heteroecera) alfkeni* Risch, 2003**

Material examined: Chaharmahal and Bakhtiari province, Shahrekord, Teshniz (32°05'20.43" N, 50°47'08.96" E), 2055m, 21.IV.2017, 2♂♂, pinned (IPIM-YU).

General distribution: Middle East ([Ascher & Pickering, 2016](#)).

Host plant associations: *Astragalus* sp. (Fabaceae).

***Eucera (Eucera) cypria* Alfken, 1933**

Material examined: Chaharmahal and Bakhtiari province, Shahrekord, Teshniz (32°05'20.43" N, 50°47'08.96" E), 2055m, 21.IV.2017, 1♂, 23.IV.2017, 1♂, pinned (IPIM-YU).

General distribution: southeastern Europe and Middle East ([Ascher & Pickering, 2016](#)).

Host plant associations: *Astragalus* sp. (Fabaceae).

***Eucera* sp.**

Material examined: Chaharmahal and Bakhtiari province, Shahrekord, Teshniz (32°05'20.43" N, 50°47'08.96" E), 2055m, 21.IV.2017, 2♂♂, pinned (IPIM-YU).

Host plant associations: *Astragalus* sp. (Fabaceae).

***Anthophora* sp.**

Material examined: Chaharmahal and Bakhtiari province, Kuhrang, Dimeh (32°26'12.35" N, 50°09'24.22" E), 2228m, 29.V.2016, 1♀, Shahrekord, Asadabad (32°22'41.46" N, 50°35'36.62" E), 2227.20m, 5.X.2016, 1♀; Shahrekord, Asadabad, 2227.20m, 5.X.2016, 1♀; Shahrekord, Teshniz (32°05'20.43" N, 50°47'08.96" E), 2055m, 21.IV.2017, 1♂; pinned (IPIM-YU).

Host plant associations: *Astragalus* sp. and *Medicago* sp. (Fabaceae).

Family: Andrenidae**Subfamily: Andreninae*****Andrena* sp.**

Material examined: Chaharmahal and Bakhtiari province, Shahrekord, Teshniz (32°05'20.43" N, 50°47'08.96" E), 2055m, 21.IV.2017, 2♂♂; 23.IV.2017, 1♀; Shahrekord, Nafch (32°24'49.63" N, 50°38'20.84" E), 2230m, 2.VIII.2016, 1♀; Kuhrang, Dimeh (32°26'12.35" N, 50°09'24.22" E), 2228m, 29.V.2016, 1♀; Khozestan province, Dezful, Shahyoun Baghcheban (32°36'53.30" N, 48°35'24.23" E), 1200m, 15.III. 2017, 1♀, pinned (IPIM-YU).

Host plant associations: *Astragalus* sp. and *Medicago* sp. (Fabaceae); *Sinapis* (Brassicaceae) and *Foumaria* (Papaveraceae).

Mite association: *Imparipes* sp. (Scutacaridae).

Identified mites

The mites were identified from the three orders of Trombidiformes, Acariformes and Sarcoptiformes, and families of Neopygmephoridae, Chaetodactylidae, Anoitidae, Acaridae, Saprogllyphidae and Winterschmidtidae (Table 1). Identified genus was *Parapygmephorus*, *Sennertia*, *Sennertionyx*, *Chaetodactylus*, *Anoetus*, *Vidia*, *Sancassania*, *Crabrovidia* and *Imparipes*.

Mites *Sennertia zhelochovtsevi*, *Vidia lineata*, *Sennertionyx manicati* and *Crabrovidia oudemansi* were new for the fauna of Iran and the Mite *Imparipes* sp. and

Chaetodactylus sp. these two species are new to science but will be described elsewhere was new for the science (Table 1).

Table 1. List of phoretic mites on bees (Hymenoptera: Apoidea).

Order	Family	Species		
Trombidiformes	Neopygmephoridae	1. <i>Parapygmephorus crossi</i> Mahunka, 1974 2. <i>Parapygmephorus khorasanicus</i> Hajiqaanbar and Khaustov, 2011 3. <i>Parapygmephorus delyorum</i> Mahunka, 1980		
	Scutacaridae	1. <i>Imparipes</i> sp.		
Acariformes	Chaetodactylidae	1. <i>Sennertia nr.zhelochovtsevi</i> Zachvatkin, 1941 2. <i>Sennertia (Sennertia) cerambycina</i> (Scopoli, 1763) 3. <i>Chaetodactylus</i> sp.		
Sarcoptiformes	Anoetidae	1. <i>Anoetus szelenyii</i> Mahunka, 1974 2. <i>Anoetus</i> sp.1 3. <i>Anoetus</i> sp.2 4. <i>Anoetus</i> sp.3		
		Winterschmidtidae	1. <i>Vidia lineate</i> Oudemans, 1917 2. <i>Vidia</i> sp.1 3. <i>Vidia</i> sp.2	
			Acaridae	1. <i>Sancassania</i> sp. 2. <i>Sennertionyx manicati</i> (Giard, 1900)
				Saproglyphidae

Table 2. Identified mites associated with bees from Trombidiformes.

Bees species	Mite species	Number of mites
<i>Halictus resurgens</i>	<i>Parapygmephorus crossi</i>	207
	<i>Parapygmephorus khorasanicus</i>	14
	<i>Parapygmephorus delyorum</i>	2
<i>Halictus patellatus</i>	<i>Parapygmephorus crossi</i>	3
	<i>Parapygmephorus khorasanicus</i>	3
<i>Anthophora</i> sp.	<i>Imparipes</i> sp.	12

Table 3. Identified mites associated with bees from Sarcoptiformes.

Bees Species	Mite Species	Number of mites
<i>Pseudapis endentata</i>		
<i>Pseudapis diversipes</i>	<i>Anoetus szelenyii</i>	217
<i>Pseudapis bispinosa</i>		
<i>Lasioglossum mesosclerum</i>	<i>Anoetus</i> sp.1	10
<i>Halictus resurgens</i>	<i>Anoetus</i> sp.2	24
<i>Halictus brunnescens</i>		
<i>Halictus resurgens</i>	<i>Anoetus</i> sp.3	18
<i>Halictus brunnescens</i>		
<i>Megachile albisepta</i>	<i>Vidia lineata</i>	23
<i>Megachile pilidens</i>	<i>Vidia</i> sp.1	14
<i>Megachile centuncularis</i>		
<i>Megachile anatolica</i>	<i>Vidia</i> sp.2	19
<i>Megachile pilidens</i>		
<i>Megachile centuncularis</i>	<i>Sancassania</i> sp.	5
<i>Halictus resurgens</i>	<i>Crabrovidia oudemansi</i>	1
<i>Xylocopa olivieri</i>	<i>Sennertia</i> nr. <i>zhelochovtsevi</i>	7
<i>Lithurgus chrysurus</i>	<i>Sennertia</i> nr. <i>zhelochovtsevi</i>	5
<i>Anthidium taeniatum</i>	<i>Sennertionyx manicati</i>	4
<i>Xylocopa varentzowi</i>	<i>Sennertia</i> (<i>Sennertia</i>) <i>cerambycina</i>	10
<i>Xylocopa varentzowi</i>		1
<i>Lithurgus chrysurus</i>	<i>Chaetodactylus</i> sp.	10

Discussion

By examination of 1220 pollinator bees which were collected from different regions in cities and villages of Chaharmahal and Bakhtiari province, Yasouj and Dezful for associated mites, we found that bees are belong to Four families including Andrenidae, Megachilidae, Halictidae, and Apidae. Of these, 46 species were identified, of which 15 bees species (n= 148 bees specimens) were associated by mites. Like other research on bee-mite link (Azhari et al., 2018a, 2018b; Kiani Bakiani et al., 2016; Hajiqanbar et al., 2011; Ebermann & Fain, 2002; Woodring, 1973; Oconnor & Eickwort, 1988; Eickwort, 1990), the family, Halictidae had the highest association. In

study areas, bees of family Andrenidae had the least association. The most frequent bee-mite association observed on *Halictus resurgens* Nurse, 1903. So far, there has not been raised a comprehensive checklist of mites associated with bees in Iran. Several limited studies by Azhari et al. (2018a, 2018b) and Kiani Bakiani et al. (2016) introduced a number of mite species associated bees in Fars, Tehran and Ardebil provinces. Recently, Azhari et al. (2018b) reported *P. crossi* Mahunka, 1974 from *Halictus* (*Halictus*) *resurgens* Nurse, 1903 from Yasuj (Park-e- jangali). We found 18 phoretic mite species associated with these bees.

The most commonly found mites in this study on Apoidea superfamily were belonging to Sarcoptiformes superorder and family of Anoetidae. In this study, the mite samples belonged to nine genera, which the most commonly associated mites were of the genus *Anoetus*. Our observations shown that often, the most abundant populations of associated mites are in form of deutonymphs which called hypopus (plural: hypopi). We observed in our samples dense populations of these mites on bees collected from nature. But one of the main problems always is the absence of an internal expert for identifications of hypopus mites form and a shortage of foreign specialists.

Although some Iranain known experts have done good research on mites in Iran, the need for training specialists on this type of mites in our country is necessary. However, all know that Iran has a very rich fauna. Therefore, future comprehensive planning should be training the specialists in different animal taxa because it can help preserve the genetic resources of our country and also we should considering training of specialist who could be expert on world's animal taxa based on our rich fauna which needs to have a comprehensive big museums and collections.

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Conflict of Interests

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

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بررسی زنبورهای بالاخانواده Apoidea (Insecta: Hymenoptera) و کنه‌های مرتبط با آنها در استان چهارمحال و بختیاری ایران

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چکیده: در این مطالعه، ۴۶ گونه از زنبورهای گرده‌افشان بالا خانواده Apoidea و ۱۷ گونه از کنه‌های مرتبط به آنها، از استان چهارمحال و بختیاری و تعدادی دیگر از گونه‌ها از یاسوج و دزفول جمع‌آوری و مورد بررسی قرار گرفت. چهار گونه از کنه‌ها برای ایران جدید بودند: *Vidia lineata*, *Sennertia zhelochovtsevi*, *Crabrovidia oudemansi* و *Sennertionyx manicati*. این کنه‌ها بر روی زنبورهای خانواده‌های Halictidae، Megachilidae، Apidae و Andrenidae شناسایی شدند. کنه‌های شناسایی شده متعلق به خانواده‌های Neopygmephoridae، Scutacaridae، Chaetodactylidae، Anoetidae، Saproglyphidae و Winterschmidtidae بودند. در میان زنبورهای شناسایی شده بیشترین کنه‌های همراه، روی نمونه‌های خانواده Halictidae و کمترین آنها روی خانواده Andrenidae مشاهده شده است. گونه‌ی *Halictus (Halictus) resurgens* Nurse, 1903 دارای بالاترین درصد ارتباط با کنه‌ها بود. تمام نمونه‌ها در کلکسیون حشرات گرده‌افشان ایران در دانشگاه یاسوج نگهداری می‌شوند. در این مقاله لیستی از گونه‌های کنه‌های همراه با زنبورها و گونه‌های زنبورها ارائه شده است. بعضی از نمونه‌ها متعلق به جنس *Chaetodactylus* Rondani, 1866 و *Imparipes* Berlese, 1903 (نمونه ۱۲) و (نمونه ۱۱) برای دنیای علم جدید بودند که در مقاله‌ی بعدی شرح داده می‌شوند.

واژگان کلیدی: Apoidea، کنه‌ها، ایران، زنبورهای گرده‌افشان