A survey on Apoidea bees (Insecta: Hymenoptera) and their associated mites in Fars Province, Iran

Setare Kiani Bakiani¹, Alireza Monfared¹*, Hamidreza Hajiqanbar² and Shahrzad Azhari³

¹ Department of Plant Protection, Faculty of Agriculture, Yasouj University, P. O. Box: 75918-74831, Yasouj, Iran.
² Department of Entomology, Faculty of Agriculture, Tarbiat Modares University, 14115-336, Tehran, Iran.

ABSTRACT. In this research 52 species of bees (Hymenoptera: Apoidea) have been reported from the northeastern Fars province, of which the species of *Hylaeus punctus* Förster and *Hoplitis leucomelana* Kirby were new records for Iran fauna. Among the material examined, there were 11 species of Apidae, 19 species of Halictidae, 1 species of Andrenidae, 4 species of Colletidae and 17 species of Megachilidae. Phoretic mites belonging to four genera *Parapygmephorus*, *Vidia*, *Imparipes* and *Anoetus* were associated with halictid and megachilid bees. Among associated mites with collected bees *Imparipes burgeri* Ebermann & Jagersbacher-Baumann belonging to the family Scutacaridae was new for Iran fauna and Asia. We also collected five new mite species for science. These species were belong to the genera *Parapygmephorus* (1 species), *Vidia* (1 species), and *Anoetus* (3 species) of the families Neopygmephoridae, Winterschmidtiidae and Anoetidae respectively that will be described elsewhere. All specimens are deposited in the Iranian Pollinator Insects Collection of Yasouj University.

Key words: Anoetidae, Neopygmephoridae, Phoretic mite, Pollinator bees, Scutacaridae, Winterschmidtiidae.

Introduction

Bees are the most important pollinators worldwide especially because of their foraging behavior and floral constancy (Almanza 2007). The province of Fars which is having an arid to semi-arid climate has a rich fauna of the bees on various agricultural crops. Izadi et al. (1997) have recorded 35 species of Apoidea bees from northern Fars province. Taghavi et al. (2008) studied *Bombus* species diversity in Tehran and Qazvin provinces in Central Elburz. They collected a total of 11 species of the genus *Bombus* and found that 8 species in two regions had ecological similarity. In a previous study in this province, Khodaparast and Monfared (2012) reported 177 bee species which mostly were wild bees’ species. Some researchers interested in crops pollination have been indicated that just about 15% of world’s crops are pollinated by a few

Corresponding author: Alireza Monfared, E-mail: amonfared@yu.ac.ir

Copyright © 2016, Kiani Bakiani et al. This is an open access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.
managed bee species, e.g. *A. mellifera* and *Bombus* spp., while the rest are pollinated by unmanaged solitary bees and other pollinator organisms and environmental factors (Almanza 2007). The superfamily Apoidea are the well-known pollinators mostly for their relationships with flowering plants. According to current usage Apoidea is a monophyletic group composed of both the sphecid wasps and the true bees called Apiformes or Anthophila (Michener 2007). This superfamily includes seven families which six families of Apidae, Andrenidae, Colletidae, Megachilidae, Halictidae and Melittidae are cosmopolitan and distributed in vast geographical regions while Stenotritidae restricted only to Australia. There are above mentioned six families of apoids in Iran. Previously, during examination of specimens of bees collected from this province sever infestation to mites was observed. Therefore it seemed that study of these mites would be resulted to find kinds of relationships between these two animals. Mites and bees have co-existed since the Cretaceous, and there is evidence of a close relationship between some taxa, probably resulting from a co-evolutionary process (Klimov et al. 2007). Numerous mite species use hymenopterous insects as phoretic hosts (e.g. Fain et al. 1999).

Bee-mite associations are well known but poorly understood (e.g. Fain et al. 1999; Fain and Pauly 2001; Walter et al. 2002). The taxonomical and biological information about these mites are poorly studied in most parts of the world. There is a need for more investigations and taxonomical studies on these mites (Hajiqanbar 2011). In this survey, we collected bees and examined them for associated mites from northeastern Fars province. Also, we recorded floral choice of bees.

**Material and methods**

Bees and associated mites were collected from suburban areas and mountainous regions of northeastern Fars Province from last June 2013 to early July 2014. We considered all specimens of Apoidea except honeybees. Sampling locations were recorded by Garmin eTrix Hc GPS. Bees were collected by insect net. Following sampling bees were killed with ethyl acetate and later pinned in laboratory. Mites were collected from their bees’ hosts under an Olympus SZX 10 stereo-microscope, cleared in Nesbitt's fluid and mounted in Fauremedium. All identified species were deposited in the “Iranian pollinator Insects - Collection”, of Plant Protection Department at the Faculty of Agriculture, Yasouj University, Yasouj, Iran (IPIC-YU). Also, floral choice visited by bee species from each locality were collected and identified. New record of bees for Iranian fauna is indicated with an asterisk.

**Results**

Collected bees species, floral choice families and associated mites species are mentioned in Tables 1 to 2.

**Collected bees:** Bees collected represent five families, eight subfamilies, nine tribes and 20 genera. The number of related species is shown in Table 1. The most frequent and diverse bee’s genera with nine, six, six and three species, respectively, were belonged to *Halictus, Lasioglossum, Osmia* and *Bombus*. Among families, Halictidae, with 19 collected species had the highest frequency of bees species in this study.

**Family:** Andrenidae, **Subfamily:** Andreninae

*Andrena fuscosa* Erichson, 1835

**Material examined:** Fars province, Sepidan, Sarbast, 2043m, 25.IV.2014, 1 ♀, pinned (IPIC-YU).

Host plant associations: *Vicia* sp. (Fabaceae), *Medicago sativa* (Fabaceae), *Lepidium draba* (Brassicaceae).

Family: Apidae
Subfamily: Apinae, Tribe: Ancylini
*Tarsalia ancyliformis* Popov, 1935

Material examined: Fars province, Shiraz, Ghareh ghomshes, 1860m, 21.VII.2013, 1 ♀, pinned (IPIC-YU).

General distribution: Sardinia, Turkey, Iran, Tajikistan, Turkmenistan and Israel (Ascher and Pickering 2016).

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

*Tarsalia hirtipes* Morawitz, 1895

Material examined: Fars province, Shiraz, Ghareh ghomshes, 1860m, 21.VII.2013, 1 ♀, pinned (IPIC-YU).

General distribution: Central Asia (Turkmenistan, Uzbekistan, Tajikistan) but occurs westward to Iran, Turkey, and the islands of Cyprus and Sardinia, and southward to Sudan (Michener 2007; Ascher and Pickering 2016).

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

Family: Apidae
Subfamily: Apinae, Tribe: Bombini
*Bombus* (Thoracobombus) *armeniacus* Radoszkowski, 1877

Material examined: Fars province, Sepidan, Poladkaf complex, 2500m, 17.VI.2013, 6 ♀♀, pinned (IPIC-YU).

General distribution: Bulgaria, Yugoslavia, Greece, Poland, Russia and Iran (Aytekin et al. 2002; Ascher and Pickering 2016).

Host plant associations: *Sophora* sp. (Fabaceae), *Euphorbia* sp. (Euphorbiaceae), *Salvia* sp. (Lamiaceae), *Vicia* sp. (Fabaceae), *Silybum* sp. (Asteraceae).

---

**Table 1.** List of bees collected in northeastern Fars Province, Iran.

<table>
<thead>
<tr>
<th>Family</th>
<th>Subfamily</th>
<th>Tribe</th>
<th>Genus</th>
<th>Number of Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apidae</td>
<td>Apinae</td>
<td>Bombini</td>
<td><em>Bombus</em></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Euceria</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Andrenidae</td>
<td>Nomadinae</td>
<td>Ancylini</td>
<td><em>Tetraloniella</em></td>
<td>3</td>
</tr>
<tr>
<td>Colletidae</td>
<td>Andreninae</td>
<td>Colletini</td>
<td><em>Tarsalia</em></td>
<td>2</td>
</tr>
<tr>
<td>Halictidae</td>
<td>Halictinae</td>
<td>Halictini</td>
<td><em>Andrena</em></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><em>Colletes</em></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><em>Hylaeus</em></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><em>Halictus</em></td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><em>Lasioglossum</em></td>
<td>6</td>
</tr>
<tr>
<td>Megachilidae</td>
<td>Megachilinae</td>
<td>Osmiini</td>
<td><em>Nomiaipis</em></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><em>Pseudapis</em></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><em>Heriades</em></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><em>Hoplitis</em></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><em>Osmia</em></td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><em>Lithurgus</em></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><em>Colioxys</em></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><em>Afranthidium</em></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><em>Anthidium</em></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><em>Anthidielium</em></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><em>Pseudoanthidium</em></td>
<td>1</td>
</tr>
</tbody>
</table>
Family: Apidae
Subfamily: Apinae, Tribe: Eucerini

Eucera (Hetereucera) clypeata Erichson, 1835
Material examined: Fars province, Shiraz, Golestan town, 1937m, 30.VI.2013, 1♀, pinned (IPIC-YU).
General distribution: Croatia, Tunisia, Algeria, Europe and Eastern Asia (Ascher and Pickering 2016).
Host plant associations: Lepidium draba (Brassicaceae), Astragalus sp. (Fabaceae), Taraxacum officinale (Asteraceae), Carthamus lanatus (Asteraceae), Cichorium sp. (Asteraceae).

Eucera (Pteneucera) nigrifacies Lepeletier, 1841
Material examined: Fars province, Sepidan, Sar Bast, 2043m, 21.VI.2013, 3 ♂♂, pinned (IPIC-YU).
General distribution: Jordan, Iran, Azerbaijan, Turkey, Tunisia, Morocco and Europe (Michener 2007; Ascher and Pickering 2016).
Host plant associations: Lepidium draba (Brassicaceae), Taraxacum officinale (Asteraceae), Medicago sativa (Fabaceae) and Cichorium sp. (Asteraceae).

Eucera major Risch, 1997
(Subgenus is not determined for this species in taxonomy.)
Material examined: Fars province, Sepidan, Kahkran, 2400m, 12.VII.2013, 2 ♀♀, pinned (IPIC-YU).
Host plant associations: Lepidium draba (Brassicaceae) and Euphorbia L. (Euphorbiaceae).

Tetraloniella glauca Fabricius, 1775
Material examined: Fars province, Shiraz, Ghasreghomshe, 1860m, 21.VII.2013, 6♀♀, pinned (IPIC-YU).
General distribution: Iran, Iraq, Turkey, Cyprus and Bergama (Ascher and Pickering 2016).
Host plant associations: Astragalus sp. (Fabaceae), Carthamus lanatus (Asteraceae).

Tetraloniella menthae Risch, 1997
Material examined: Fars province, Sepidan, 2250m, 27.VII.2013, 5 ♀♀, pinned (IPIC-YU).
General distribution: Iran, Iraq and Turkey (Ascher and Pickering 2016).
Host plant associations: Sophora sp. (Fabaceae), Euphorbia L. (Euphorbiaceae), Salvia sp. (Lamiaceae), Vicia sp. (Fabaceae), Silybum sp. (Asteraceae).
**Tetraloniella** (*Glazunovia*) **nigriceps** (Morawitz, 1895)

**Material examined:** Fars province, Sepidan, Dashte Saran, 2420m, 10.VII.2013, 6 ♀♀, pinned (IPIC-YU).

**General distribution:** Afghanistan, Turkey, Iran, Tajikistan and Turkmenistan (Michener 2007; Ascher and Pickering 2016).

**Host plant associations:** *Euphorbia* L. (Euphorbiaceae), *Salvia* sp. (Lamiaceae), *Vicia* sp. (Fabaceae), *Silybum* sp. (Asteraceae).

**Family:** Colletidae  
**Subfamily:** Colletinae, **Tribe:** Colletini

**Colletes bidentulus** Noskiewicz, 1936

**Material examined:** Fars province, Shiraz, Sarmor, 1900m, 28.VII.2013, 2 ♂♂, pinned (IPIC-YU).

**General distribution:** Azerbaijan, Turkey, Iran, Uzbekistan and Tajikistan (Ascher and Pickering 2016).

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

**Colletes ottomanus** Noskiewicz, 1958

**Material examined:** Fars province, Shiraz, Golestan town, 1937m, 30.VI.2013 and Shiraz, Ghasreghomshe, 1860m, 21.VII.2013, 1 ♂, 1 ♀, pinned (IPIC-YU).

**General distribution:** Azerbaijan, Turkey, Iran, Uzbekistan and Tajikistan (Ascher and Pickering 2016).

**Host plant associations:** *Astragalus* sp. (Fabaceae), *Carthamus lanatus* (Asteraceae).

**Family:** Colletidae  
**Subfamily:** Hylaeinae

**Hylaeus** (*Dentigera*) **intermedius** Förster, 1871

**Material examined:** Fars province, Sepidan, Tarbiat badani complex, 2500m, 17.VI.2013, 1♀, pinned (IPIC-YU).

**General distribution:** Lebanon, Iran, Russia and Europe (Ascher and Pickering 2016).

**Host plant associations:** *Sophora* sp. (Fabaceae), *Euphorbia* sp. (Euphorbiaceae), *Salvia* sp. (Lamiaceae).

**Hylaeus punctus*** Förster, 1871

**Material examined:** Fars province, Sepidan, Tarbiat badani complex, 2500m, 17.VI.2013, 1♀, pinned (IPIC-YU).

**General distribution:** Lebanon, Greece, Croatia, Italy and Turkey (Ascher and Pickering 2016).

**Host plant associations:** *Sophora* sp. (Fabaceae), *Euphorbia* L. (Euphorbiaceae), *Salvia* sp. (Lamiaceae).

**Family:** Halictidae  
**Subfamily:** Halictinae, **Tribe:** Halictini

**Halictus** (*Halictus*) **brunnescens** Eversmann, 1852

**Material examined:** Fars province, Sepidan, Dashte Saran, 2420m, 10.VII.2013 and Sepidan, Sarbast, 2043m, 19.VII.2013, 2♀♀, pinned (IPIC-YU).

**General distribution:** Europe to Eastern Asia (Nadimi 2016; Ascher and Pickering 2016).

**Host plant associations:** *Sophora* sp. (Fabaceae), *Euphorbia* L. (Euphorbiaceae), *Salvia* sp. (Lamiaceae).

**Halictus** (*Seladonia*) **cephalicus** Morawitz, 1873

**Material examined:** Fars province, Sepidan, 2250m, 27.VII.2013, Kamfiroz, 1850m, 31.VIII.2013 and Sepidan, Golestan town, 1937m, 29.VIII.2013and Sepidan, Sarbast, 2043m, 2.IX.2013, 8♀♀, pinned (IPIC-YU).

**General distribution:** Eastern Europe to central Asia (Nadimi 2016; Ascher and Pickering 2016).

**Host plant associations:** *Astragalus* sp. (Fabaceae), *Vicia* sp. (Fabaceae), *Medicago sativa* (Fabaceae), *Lepidium draba* (Brassicaceae), *Mentha pulegium* (Lamiaceae), *Taraxacum officinale* (Asteraceae), *Oryza* sp. (Poaceae), *Silybum* sp. (Asteraceae), *Cichorium* sp.
Apoidea in Fars Province

(Asteraceae), Portulaca sp. (Portulacaceae), Capsicum sp. (Solanaceae).

Halictus (Seladonia) lucidipennis Smith, 1853
Material examined: Fars province, Sepidan, Sarbast, 2043m, 4.VIII.2013 and Shiraz, Golestan town, 1937m, 29.VIII.2013, 5 ♀♀, pinned (IPIC-YU).
Host plant associations: Vicia sp. (Fabaceae), Medicago sativa (Fabaceae), Lepidium draba (Brassicaceae), Astragalus sp. (Fabaceae), Cichorium sp. (Asteraceae), Portulaca sp. (Portulacaceae), Capsicum sp. (Solanaceae).

Halictus (Halictus) patellatus Morawitz, 1873
Material examined: Fars province, Sepidan, 2250m, 27.VII.2013, 2 ♀♀, pinned (IPIC-YU).
General distribution: Eastern and South of Europe and Eastern of Asia.
Host plant associations: Vicia sp. (Fabaceae), Mentha pulegium (Lamiaceae), Silybum sp. (Asteraceae).

Halictus (Halictus) resurgens Nurse, 1903
Material examined: Fars province, Kamfiroz, 1850m, 31.VIII.2013 and Shiraz, Sarmor, 1900m, 28.VII.2013, 3 ♂♂, 1 ♀, pinned (IPIC-YU).
General distribution: Europe to eastern Asia (Nadimi 2016 Ascher and Pickering 2016).
Host plant associations: Vicia sp. (Fabaceae), Medicago sativa (Fabaceae), Lepidium draba (Brassicaceae), Cichorium sp. (Asteraceae).

Halictus (Seladonia) subauratoides Blüthgen, 1926
Material examined: Fars province, Sepidan, Sarbast, 2043m, 2.IX.2013, 1 ♀, pinned (IPIC-YU).
General distribution: Europe to East Asia (Ascher and Pickering 2016).
Host plant associations: Vicia sp. (Fabaceae), Medicago sativa (Fabaceae), Lepidium draba (Brassicaceae).

Halictus (Halictus) submodernus Blüthgen, 1936
Material examined: Fars province, Shiraz, Ghasreghomshe, 1860m, 21.VII.2013 and Sepidan, 2250m, 27.VII.2013, 3 ♀♀, pinned (IPIC-YU).
General distribution: Turkey and Iran (Ascher and Pickering 2016).
Host plant associations: Vicia sp. (Fabaceae), Mentha pulegium (Lamiaceae), Astragalus sp. (Fabaceae), Cardthamus lanatus (Asteraceae), Silybum sp. (Asteraceae).

Halictus (Halictus) tetrazonianellus Strand, 1909
Material examined: Fars province, Sepidan, Sarbast, 2043m, 4.VIII.2013, 2 ♀♀, pinned (IPIC-YU).
General distribution: South of Europe and Eastern of Asia (Ascher and Pickering, 2016).
Host plant associations: Vicia sp. (Fabaceae), Medicago sativa (Fabaceae), Lepidium draba (Brassicaceae), Cichorium sp. (Asteraceae).

Halictus (Vestitohalictus) tuberculatus Blüthgen, 1925
Material examined: Fars province, Sepidan, Tarbitbadani complex, 2500m, 17.VI.2013 and Sepidan, 2250m, 27.VII.2013, 1 ♀, 1 ♂, pinned (IPIC-YU).
General distribution: Iran, Turkey and Ukraine (Ascher and Pickering 2016).
Host plant associations: Sophora sp. (Fabaceae), Euphorbia L. (Euphorbiaceae), Salvia sp. (Lamiaceae), Vicia sp. (Fabaceae), Medicago sativa (Fabaceae), Lepidium draba (Brassicaceae), Silybum sp. (Asteraceae).
**Lasioglossum (Lasioglossum) aegyptiellum Strand, 1909**

**Material examined:** Fars province, Shiraz Golestan town, 1937m, 30.VI.2013, Sepidan, 2250m, 27.VII.2013 and Shiraz, Ghasreghomshe, 1860m, 21.VII.2013, 3 ♀♀, pinned (IPIC-YU).

**General distribution:** Europe to Middle East, North Africa (Nadimi 2016; Güler et al. 2011; Ascher and Pickering 2016).

**Host plant associations:** *Vicia* sp. (Fabaceae), *Mentha pulegium* (Lamiaceae), *Astragalus* sp. (Fabaceae), *M. sativa* (Fabaceae), *Lepidium draba* (Brassicaceae), *Carthamus lanatus* (Asteraceae).

**Lasioglossum (Lasioglossum) discum Smith, 1853**

**Material examined:** Fars province, Shiraz, Ghasreghomshe, 1860m, 21.VII.2013 and Shiraz, Sarmor, 1900m, 28.VII.2013, 2 ♀♀, pinned (IPIC-YU).

**General distribution:** Europe to central Asia, North Africa (Nadimi 2016; Ascher and Pickering 2016).

**Host plant associations:** *Astragalus* sp. (Fabaceae), *Carthamus lanatus* (Asteraceae), *Vicia* sp. (Fabaceae), *M. sativa* (Fabaceae).

**Lasioglossum (Evylaeus) clypeiferellum Strand, 1909**

**Material examined:** Fars province, Shiraz Golestan town, 1937m, 29.VIII.2013, 1 ♀.

**General distribution:** Mongolia, Tajikistan, Afghanistan, Iran, Cyprus, Greece and Croatia (Ascher and Pickering 2016).

**Host plant associations:** *Portulaca* sp. (Portulacaceae), *Capsicum* sp. (Solanaceae).

**Lasioglossum (Evylaeus) malachurum Kirby, 1802**

**Material examined:** Fars province, Sepidan, Sarbast, 2043m, 12.IV.2013, 4.VII.2013 and Shiraz, Sarmor, 1900m, 28.VII.2013, 2 ♀♀, 2 ♂♂, pinned (IPIC-YU).

**General distribution:** Europe to Eastern Asia, North Africa (Nadimi 2016; Ascher and Pickering 2016).

**Host plant associations:** *Astragalus* sp. (Fabaceae), *Medicago sativa* (Fabaceae), *Lepidium draba* (Brassicaceae), *Carthamus lanatus* (Asteraceae), *Vicia* sp. (Fabaceae), *M. sativa* (Fabaceae).

Family: Halictidae

Subfamily: Nomiinae

*Nomiapis (Nomiapis) bispinosa* Brullé, 1832

**Material examined:** Fars province, Shiraz, Ghasreghomshe, 1860m, 21.VII.2013 and Shiraz, Sarmor, 1900m, 28.VII.2013, 3 ♂♂, 1 ♀, pinned (IPIC-YU).

**General distribution:** Europe to Eastern Asia, North Africa (Nadimi 2016; Ascher and Pickering 2016).

**Host plant associations:** *Astragalus* sp. (Fabaceae), *Carthamus lanatus* (Asteraceae), *Vicia* sp. (Fabaceae), *M. sativa* (Fabaceae).
**Nomia** *Nomia* diversipes Latreille, 1806

**Material examined:** Fars province, Sepidan, Sarbast, 2043m, 21.VI.2013, 4.VIII.2013, 2.IX.2013 and 16.IX.2013, Shiraz, Sarmor, 1900m, 28.VII.2013, Shiraz Golestan town, 1937m, 30.VI.2013, Sepidan, Dashte Saran, 2420m, 10.VII.2013 and Sepidan, 2250m, 27.VII.2013, 6 ♂♂, 10 ♀♀, pinned (IPIC-YU).

**General distribution:** Europe to Eastern Asia (Nadimi 2016; Ascher and Pickering 2016).

**Host plant associations:** *Vicia* sp. (Fabaceae), *Medicago sativa* (Fabaceae), *Lepidium draba* (Brassicaceae), *Silybum* sp. (Asteraceae), *Cichorium* sp. (Asteraceae).

**Pseudapis** *Pseudapis* sp. A

**Material examined:** Fars province, Shiraz, Ghasreghomshe, 1860m, 21.VII.2013, 1 ♀, pinned (IPIC-YU).

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

**Pseudapis** *Pseudapis* sp. B

**Material examined:** Fars province, Sepidan, Kahkran, 2400m, 12.VII.2013, 1 ♀, pinned (IPIC-YU).

**Host plant associations:** *Lepidium draba* (Brassicaceae), *Euphorbia* L. (Euphorbiaceae).

**Family:** Megachilidae

**Subfamily:** Megachilinae, Tribe: Osmiini

**Heriades clavicornis** Morawitz, 1875

**Material examined:** Fars province, Shiraz, Sadra, 1800m, 18.V.2014, 1 ♂, pinned (IPIC-YU).

**General distribution:** Tajikistan, Kazakhstan, Georgia, Iran and Europe (Ascher and Pickering 2016).

**Host plant associations:** *Astragalus* sp. (Fabaceae), *Carthamus lanatus* (Asteraceae).

**Osmia brevicornis** Fabricius, 1798

**Material examined:** Fars province, Sepidan, Sarbast, 2043m, 25.IV.2014 and 2.V.2014, 6 ♀♀, pinned (IPIC-YU).

**General distribution:** Kazakhstan, Uzbekistan, Afghanistan, Iran and Europe (Ascher and Pickering 2016).

**Host plant associations:** *Vicia* sp. (Fabaceae), *Medicago sativa* (Fabaceae), *Lepidium draba* (Brassicaceae).

**Osmia caerulescens** Linnaeus, 1758

**Material examined:** Fars province, Sepidan, Sarbast, 2043m, 4.VIII.2013, 11.IV.2014, 25.IV.2014 and 2.V.2014, 1 ♀, 3 ♂♂, pinned (IPIC-YU).

**General distribution:** USA, Canada, Russia, New Zealand, India, Kazakhstan, Iran and Europe (Ascher and Pickering 2016).

**Host plant associations:** *Vicia* sp. (Fabaceae), *Medicago sativa* (Fabaceae), *Lepidium draba* (Brassicaceae).

**Hoplitis** *Hoplitis* leucomelana Kirby, 1802

**Material examined:** Fars province, Kamfiroz, 1850m, 31.VIII.2013, 2 ♀♀, pinned (IPIC-YU).

**General distribution:** Russia, China, Mongolia, Tajikistan, Kazakhstan, Georgia, Iran and Europe (Ascher and Pickering 2016).

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

**Hoplitis uncaticornis** Stanek, 1969

**Material examined:** Fars province, Shiraz, Sadra, 1800m, 18.V.2014, 1 ♂, pinned (IPIC-YU).

**General distribution:** Tajikistan, Kazakhstan, Georgia, Iran and Europe (Ascher and Pickering 2016).

**Host plant associations:** *Astragalus* sp. (Fabaceae), *Carthamus lanatus* (Asteraceae).
Osmia difficilis Morawitz, 1875
Material examined: Fars province, Sepidan, Kahkran, 2400m, 16.V.2014, 1 ♀, pinned (IPIC-YU).
General distribution: Russia, Iran, Tajikistan, Turkey and Israel (Ascher and Pickering 2016).
Host plant associations: Lepidium draba (Brassicaceae), Euphorbia L. (Euphorbiaceae).

Osmia dives Mocsáry, 1877
Material examined: Fars province, Shiraz, Anjireh, 1800m, 21.V.2014, 2 ♀♀, pinned (IPIC-YU).
General distribution: Kyrgyzstan, Turkmenistan, Iran, Cyprus, Greece and Hungary (Ascher and Pickering 2016).
Host plant associations: Astragalus sp. (Fabaceae), Carthamus lanatus (Asteraceae).

Osmia fasciata Latreille, 1811
Material examined: Fars province, Shiraz, Derak, 2100m, 28.V.2014, 2 ♀♀, pinned (IPIC-YU).
General distribution: India, Pakistan, Afghanistan, Uzbekistan, Iran and Syria (Ascher and Pickering 2016).
Host plant associations: Astragalus sp. (Fabaceae), Carthamus lanatus (Asteraceae).

Osmia nigrohirta Friese, 1899
Material examined: Fars province, Sepidan, Tarbiat badani complex, 2500m, 17.VI.2013, 2 ♀♀, pinned (IPIC-YU).
General distribution: Iran, Lebanon, Turkey, Greece and Macedonia (Ascher and Pickering 2016).
Host plant associations: Sophora sp. (Fabaceae), Euphorbia L. (Euphorbiaceae), Salvia sp. (Lamiaceae).

Family: Megachilidae
Subfamily: Megachilinae, Tribe: Megachilini
Coelioxys caudata Spinola, 1838
Material examined: Fars province, Shiraz, Ghasre ghomshe, 1860m, 21.VII.2013, 1 ♀, pinned (IPIC-YU).
General distribution: Morocco, Spain, France, Italy, Greece, Romania, Iran, Turkmenistan, Kyrgyzstan, China (Ascher and Pickering 2016).
Host plant associations: Astragalus sp. (Fabaceae), Carthamus lanatus (Asteraceae).

Afranthidium carduelle Morawitz, 1876
Material examined: Fars province, Shiraz, Derak, 2100m, 28.V.2014, 1 ♀, 1 ♂, pinned (IPIC-YU).
General distribution: Spain, Greece, Turkey, Iran, Afghanistan and Tajikistan (Ascher and Pickering 2016).
Host plant associations: Astragalus sp. (Fabaceae), Carthamus lanatus (Asteraceae).
**Anthidium anguliventre Morawitz, 1888**

**Material examined:** Fars province, Shiraz, Ghasre ghomshe, 1860m, 21.VII.2013, 2 ♂♂, pinned (IPIC-YU).

**General distribution:** Oman, Jordan, Turkey, Iran, Pakistan, Turkmenistan, Kyrgyzstan and Kazakhstan (Ascher and Pickering 2016).

**Host plant associations:** *Astragalus* sp. (Fabaceae), *Carthamus lanatus* (Asteraceae).

**Anthidium taeniatum Latreille, 1809**

**Material examined:** Fars province, Sepidan, Sarbast, 2043m, 16.IX.2013, 1 ♂, pinned (IPIC-YU).

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

**Host plant associations:** *Vicia* sp. (Fabaceae), *Medicago sativa* (Fabaceae), *Lepidium draba* (Brassicaceae).

**Anthidiellum strigatum Panzer, 1805**

**Material examined:** Fars province, Shiraz, Derak, 2100m, 28.V.2014, 1 ♂, pinned (IPIC-YU).

**General distribution:** Morocco, Tunisia, Europe, Iran, Turkmenistan, Tajikistan, Kazakhstan, Russia and Korea (Ascher and Pickering 2016).

**Host plant associations:** *Astragalus* sp. (Fabaceae), *Carthamus lanatus* (Asteraceae).

**Pseudoanthidium scapulare Latreille, 1809**

**Material examined:** Fars province, Shiraz, Ghasre ghomshe, 1860m, 21.VII.2013, 2 ♂♂, pinned (IPIC-YU).

**General distribution:** Algeria, Spain, France and Iran (Ascher and Pickering 2016).

**Host plant associations:** *Astragalus* sp. (Fabaceae), *Carthamus lanatus* (Asteraceae).

**Identified mites**
Phoretic mites collected on bees represent 2 orders, 4 families, 4 genera and 7 species. Five species are new to science that will be described elsewhere and *Imparipes burgeri* Ebermann & Jagersbacher-Baumann is new for Asia (Table 2). The family Halictidae showed highest amount of frequency of 7.3 Percent (Fig. 1). The genus Halictus had highest percent of frequency (Fig. 2).

<table>
<thead>
<tr>
<th>Order</th>
<th>Family</th>
<th>Species</th>
<th>Host</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trombidiformes</td>
<td>Scutacaridae</td>
<td><em>Imparipes burgeri</em> Ebermann &amp; Jagersbacher-Baumann</td>
<td>L. clypeiferellum</td>
</tr>
<tr>
<td></td>
<td>Neopygmephoridae</td>
<td><em>Parapygmephorus magnisetosus</em> Khaustov &amp; Zaloznaya</td>
<td><em>H. resurgens</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Parapygmephorus</em> sp. 1</td>
<td><em>H. resurgens</em></td>
</tr>
<tr>
<td>Sarcoptiformes</td>
<td>Winterschmidtiiidae</td>
<td><em>Vidia</em> sp.</td>
<td>Megachile sp.</td>
</tr>
<tr>
<td></td>
<td>Anoetidae</td>
<td><em>Anoetus</em> sp. 1</td>
<td><em>H. patellatus</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Anoetus</em> sp. 2</td>
<td><em>H. resurgens</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Anoetus</em> sp. 3</td>
<td><em>N. diversipes</em></td>
</tr>
</tbody>
</table>
Figure 1. Total number of bees in different families and their contamination rate by mites (A). Frequency of different families of bees associated with mites (B).

Figure 2. Total number of bees in different genera and their contamination rate by mites, (A). Frequency percents of different bees’ genera associated with mites, (B).
Discussion
Among the bee families were collected from northern Fars, the most frequent species were respectively, belonging to Megachilidae, Apidae and Halictidae, but most frequent bees associated with mites was belong to halictid bees. There are considerable recorded halictid bees members associated with mites in different parts of the worlds (O’Connor, 2016). In Iran, Hajiqanbar et al. (2011), recorded a new species of the genus Parapygmephorus Cross, 1965 phoretic on Halictus quadricinctus (Fabricius, 1776) (Halictidae). In the present study, 1086 specimens of Apoidea from various parts of Northeastern Fars Province including cities, villages, and counties were collected. Species of five families were identified representing 52 species. Based on specialist of bees identifications and compare to Ascher and Pickering (2016), we found two new records for the Iranian fauna. During lately decade, studies on Iranian bees have been developed: for example, Monfared et al. (2007), by collecting specimens from 20 provinces in a more vast area than what previous researchers studied, revised and cleared that at least 34 species of the genus Bombus exist in Iran. Taghavi et al. (2008), studied Bombus species diversity in Tehran and Qazvin provinces in Central Elburz. They collected a total of 11 species of the genus Bombus and detected that at least 8 species in the two regions were similar.

In this study we found three species of the genus Bombus (i.e. Bombus niveatus, Bombus zonatus and Bombus armeniacus) from Sepidan. Khodaparast and Monfared (2012) reported 177 bee species from the Fars Province, Iran. In this survey, they reported 91 new records for Iran fauna, and seven new species for science. Among these, 56 species belonged to Apidae, 49 species of Halictidae, 39 species of Megachilidae, 31 species of Andrenidae, one species of Melittidae and one species from Colletidae. Four species of Apidae, 14 of Halictidae and five species of Megachilidae are similar with this study. Khodaparast & Monfared (2013) published a taxonomic study on 14 species of four genera of the tribe Osmiini in Fars province. We found nine species from this tribe that one species is similar to this study. Also, Khodaparast & Monfared (2013) in an independent work published a taxonomic study on 26 species of the tribe Eucerini from Fars province that 19 species were new for the fauna of Iran. We reported six species of this tribe that three species are similar. Nadimi et al. (2013) studied on cleptoparasite Coelioxys bees in northern Iran and recorded a total of 11 species of which 6 species were new for the fauna of Iran. We also found Coelioxy caudate in this study. Lately, Safi, et al. (2016) recorded some species of Halictidae (Hymenoptera: Apoidea) from Gorgan county, northern Iran. At present not any comprehensive study on bees associated mites in Iran. Khaustov and Zaloznaya (2011) found Parapygmephorus magnisetasus Khaustov et Zaloznaya phoretic on Halictus sexcinctus (Fabricius) and Osmia rufa (Linnaeus) from Ukraine. We collected this species on Halictus resurgens.
Ebermann et al. (2013) reported Imparipes burgeri of the 45 host species belonging to ground-nesting host’s apoid bees from different parts of Europe. We found this species on Lasiglossum clypeiferellum that was new for Asia. Woodring (1970) separated five species of Anoetus on beetles of the family Scolytidae and also reported (1973) Anoetus vexarus associated with Lasiglossum quadrinotatus (Kirby). We found three new species of Anoetus on Halictus patellatus, H. resurgens and Nomiaapis diversipes.

Acknowledgments
The authors are very grateful to Andreas Ebmer, Alain Pauly, Stephan Kuhlmann, Dr. Holger Dathe and Dr. Pavel Klimov for their contribution to the identification of the specimens. We would like to thank Prof. Dr. Alireza Saboori and Dr. Ali Asghar Talebi for their precise comments on the first manuscript of this paper.

References


کلید واژگان: زنبورهای گردشگران، Apoidea، و Neopygmephoridae، Scutacaridae و Winterschmidtiidae، Phoretic mites