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A survey on pollinators bees (Hymenoptera: Apoidea) in parks and gardens of Shiraz city, Iran

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Abstract

In this survey we collected specimens of pollinator bees of Apoidea (Hymenoptera) on flowers of parks and gardens in Shiraz city' (capital of Fars Province, Iran), in order to species identification and determining of their species dispersal and feeding plants. Despite of existing of barriers such as high buildings, roads, factories, communication transceiver stations, vehicles, human population, radio and phone waves, etc., and addition to weather and waves pollutions thus bees come to city limits to gather pollen and nectar yet. Specimens of pollinator bees collected on cultivated permanent plant and seasonal flowers in urban parks and gardens including Eram, Afif Abad, Jahan Nama, Jannat, Delgosha, Razavi, Azadi, Golestan, Entezar, Shaghayegh and Besat. In total 31 species from superfamily Apoidea belonging to four families and 12 genera were collected and identified. Also, 19 species of food plants providing pollen and/or nectar for these bees were identified.

Key words: Pollinators bees, Apoidea, Shiraz, Parks, Gardens

Introduction

Today half of the human population lives in urban areas (UN 2007) and the urban human populations are predicted to increase in the future, both because of an overall human population increase and because people are moving from rural to urban areas. Urbanization causes drastic and persistent changes of the landscape and the environment (MCKINNEY 2006) and although urban areas only cover a small proportion of the Earth's surface, somewhere between 1 % and 6 %, they make use of a large proportion of the Earth's natural resources (ALBERTI et al. 2003). Cities are mainly dependent on goods and services produced elsewhere to support their large population (FOLKE et al. 1997), their "ecological footprint" may be ten to hundred times larger than their actual areas, (COLLINS et al., 2000; ALBERTI et al., 2003). In the United States alone, 2.2 million acres of farmland and open space are converted into urban areas every year (USDA 2000). The past studies of insect in urban parks showed that urban parks can behave as islands of useable habitat surrounded by an inhospitable sea of development, in accord with the theory of island biogeography (FAETH & KANE 1978). Recent studies demonstrate the value of parks and other green spaces for wild pollinators even fragments or habitat in urban areas. For example, San Francisco's parks support significant, and diverse, populations of bumblebees (SHEPHERD et al. 2008). Fifty-four species of bees were discovered in community gardens in East Harlem and the Bronx, New York (Matteson et al., 2008) and sixty-two species of bees were found in fragments of desert scrub habitat in Tucson, Arizona (CANE 2001). In Berlin, Germany, one-half of Germany's bee fauna were founded within city limits (CANE 2005). More than seventy species of bees were identified in the gardens of Albany and Berkeley, California (FRANKIE et al. 2002). Green spaces in towns and cities are clearly important for pollinators. (SHEPHERD et al. 2008). Iran has a vast mountainous region which cities established through them. Vice versa other cities in other countries like what's seen in London or New York, Iranian cities have not vast green spaces in their cities. In this study following report of KHODAPARAST & MONFARED (2012) on bees fauna of Fars province which mainly focused on bees collected from regions out of cities carried down to compare apoids fauna in urban parks and gardens to fields far from capital city. Shiraz is one of the five major cities of Iran . Statistical Center of Iran, based on the 2006 census, the city had a population of over 1.214.808 peoples which in 2011 the number of population have increased to 1.700.687. It has been for long times the center area in the southern Zagros regions in a relatively fertile natural place for local exchange of goods between the farmers, sedentary and nomadic areas. Shiraz have been known for years as one of the main touristic cities which drawn attentions of domestic and foreign tourists due to the city's historical attractions, cultural, religious and natural and hand made parks and gardens. City parks are contain many area which are suitable for pollinators. They can make nests in marginals of green area, around trees, hedge rows, areas near the rivers, or in protected areas. Major cities around the world recognize the value of urban beekeeping. In New York City, Chicago, London and Paris beekiping hives are known useful and legals (AMARUALIK-GAZEE 2012). Colony collapse disorder (CCD) in honeybees hives in urban areas have been less than in rural areas (AMARUALIK-GAZEE 2012). Studies have shown that urban bees are healthier and produce more honey since they are less exposed to pesticides and have higher food plants diversity sometimes (University of Worcester, UK 2010). Although we know the various barriers such as

high buildings, roads, factories, communication transceiver stations, vehicles, human populations, radio and phone waves and etc., which may ban movements of bees to enter the city places like parks and also other problems such as air pollutions including high dense CO₂ and other toxic materials of vehicles and factories and acoustic pollutions but we don't know how various bees can overcome on these problems and they come to city limits to gather pollen and nectar and establish their nests. The first pace is collecting and identifying the species which can exist in the urbans area and then other studies on their activities.

Material and methods

We conducted this study in 14 urban parks and gardens inside Shiraz city limits in the spring and summer of 2011 and 2012 (Fig. 1). Shiraz is the sixth most populous city of Iran and the capital of Fars Province. Shiraz is located in the south of Iran and the northwest of Fars Province. The latitude and longitude of Shiraz, Iran are: 29° 36' 54" N / 52° 32' 17" E. Sampling locations were recorded by Garmin atria Hc GPS. Bees were collected by insect net. We surveyed all parts of the city and collected 2.138 bee specimens. Following sampling bees were killed with ethyl acetate and later mounted in the laboratory. Samples were then database and received labels with information about location, date, collector(s)' name, and a voucher code of bees. All samples were identified to genus using keys to identification from "The Bees of The World" by MICHENER (2007). To identify species, specimens were identified by multiple experts as listed in the acknowledgment section. All identified species were deposited in the "Iranian pollinator Insect Museum", Plant Protection Group at the Faculty of Agriculture, Yasouj University, Iran. Also, Food plants of bee species from each park and garden were also identified (Table 1.).

Results

Bees collected represent 4 families, 12 genera and 31 species. The number of related species is shown in Table 2.

Table 1: List food plants of collected bees from Shiraz City.

<i>Ageratum houstonianum</i> (Asteraceae)
<i>Anemone coronaria</i> (Ranunculaceae)
<i>Antirrhinum majus</i> (Scrophulariaceae)
<i>Brassica oleracea</i> (Cruciferae)
<i>Calendula persica</i> (Asteraceae)
<i>Celosia</i> sp. (Amarantaceae)
<i>Dianthus barbatus</i> (Caryophyllaceae)
<i>Gaillardia grandiflora</i> (Asteraceae)
<i>Gazania pinata</i> (Sateraceae)
<i>Gomphrena globosa</i> (Amaranthaceae)
<i>Leucanthemum maximum</i> (Asteraceae)
<i>Portulaca grandiflora</i> (Portulacaceae)

Rosa spp. (Rosaceae)
Rosmarinus officinalis (Lamiaceae)
Senecio cineraria (Asteraceae)
Tagetes erecta (Asteraceae)
Verbena hybrida (Verbenaceae)
Viola spp (Violaceae)
Zinnia elegans (Asteraceae)

Table 2: List of bees collected in Shiraz City, Iran.

Family	Genus	Species	Total collected specimen		
A p i d a e	<i>Ceratina</i>	<i>moricei</i>	8		
		<i>tibialis</i>	23		
	<i>Eucera</i>	<i>spinipes</i>	1		
		<i>syriaca</i>	1		
		<i>zeta</i>	2		
		<i>Thyreus</i>	<i>ramosus</i>	2	
	H a l i c t i d a e	<i>Halictus</i>	<i>brunescens</i>	5	
<i>resurgens</i>			94		
<i>pollinosus</i>			5		
<i>cephalicus</i>			5		
<i>lucidipennis</i>			45		
<i>Laisoglossum</i>			<i>harputicum</i>	264	
			<i>malachurum</i>	98	
			<i>marginatum</i>	51	
			<i>lineare</i>	6	
			<i>pilosum</i>	2	
		<i>Nomiapis</i>	<i>lobata</i>	16	
			<i>diversipes</i>	70	
			<i>edentata</i>	15	
	<i>sphecodes</i>	<i>puncticeps</i>	1		
M e g a c h i l i d a e	<i>Megachile</i>	<i>apicalis</i>	2		
		<i>pivicornis</i>	5		
		<i>anatolica</i>	51		
		<i>farinosa</i>	2		
		<i>fertoni</i>	307		
			<i>minutissima</i>	14	
			<i>Anthidiellum</i>	<i>strigatum</i>	1
			<i>Anthidium</i>	<i>florentinum</i>	80
	<i>Osmia</i>	<i>signata</i>	2		
A n d r e n i d a e	<i>Andrena</i>	<i>flavipes</i>	2		
		<i>vetula</i>	3		

Bee species exist in urban parks and gardens of Shiraz

Family A p i d a e

Ceratina (Euceratina) moricei FRIESE

M a t e r i a l e x a m i n e d : Besat, 23.VII.2011, 1♀. Afif abad, 27.VII.2011, 2♀♀. Besat, 27.VIII.2011, 2♀♀. Azadi, 24.VIII.2011, 1♀. Eram, 10.V.2012, 1♀. Afif abad, 23.VII.2012, 1♀. Afif abad, 6.VIII.2012, 2♀♀.

F o o d p l a n t s : *Gomphrena globosa* (Amaranthaceae), *Senecio cineraria* (Asteraceae), *Tagets erecta* (Asteraceae), *Calendula persica* (Asteraceae), *Gaillardia grandiflora* (Asteraceae).

Ceratina (Euceratina) tibialis MORAWITZ

M a t e r i a l e x a m i n e d : Besat, 23.VII.2011, 7♀♀. Besat, 27.VII.2011, 7♀♀. Eram, 21.VII.2012, 2♂♂. Afif Abad, 30.VII.2012, 3♀♀. Afif Abad, 13.VIII.2012, 3♀♀.

F o o d p l a n t s : *Gomphrena globosa* (Amaranthaceae), *Celosia* sp. (Amarantaceae).

Eucera (Hetereucera) spinipes RISCH

M a t e r i a l e x a m i n e d : Besat, 21.IV.2012, 1♂. F o o d p l a n t s : *Rosa* spp. (Rosaceae)

Eucera (Hetereucera) syriaca DALLA TORRE

M a t e r i a l e x a m i n e d : Entezar, 3.V.2012, 1♂.

F o o d p l a n t s : *Gomphrenaglobosa* (Amaranthaceae).

Eucera (Synhalonia) zeta DALLA TORRE

M a t e r i a l e x a m i n e d : Afif Abad, 22.IV.2012, 1♂, 1♀.

F o o d p l a n t s : *Brassica oleracea* (Cruciferae).

Thyreus ramosus LEPELETIER

M a t e r i a l e x a m i n e d : Jahan Nama, 21.IX.2011, 1♀. Afif Abad, 13.VIII.2012. 1♂.

F o o d p l a n t s : *Senecio cineraria* (Asteraceae), *Zinnia elegans* (Asteraceae).

Family H a l i c t i d a e

Halictus brunnescens EVERSMAAN

M a t e r i a l e x a m i n e d : Eram, 27.VII.2011, 2♀♀. Afif Abad, 30.VII.2012, 1♀. Jahan Nama, 4.VIII.2012, 1♂.

F o o d p l a n t s : *Gomphrena globosa* (Amaranthaceae), *Leucanthemum maximum* (Asteraceae), *Zinnia elegans* (Asteraceae).

***Halictus resurgens* NURSE**

M a t e r i a l e x a m i n e d : Besat, 23.VII.2011, 2♂♂. Besat, 27.VII.2011, 1♀. Jannat, 25.VIII.2011, 10♀♀. Shaghayegh, 4.IX.2011, 1♀. Jahan Nama, 28.VII.2012, 2♂♂. Afif Abad, 23.VII.2012, 11♂♂. Afif Abad, 30.VII.2012, 13♂♂. Eram, 29.VII.2012, 1♂. Eram, 5.VIII.2012, 4♂♂, 1♀. Eram, 22.VII.2012, 4♂♂. Afif Abad, 13.VIII.2012, 11♂♂, 2♀♀. Jahan Nama, 11.VIII.2012, 3♂♂, 1♀. Afif Abad, 6.VIII.2012, 4♂♂, 3♀♀. Eram, 12.VIII.2012, 1♀. Eram, 2.VI.2012, 3♀♀. Eram, 30.IV.2012, 5♀♀. Eram, 10.V.2012, 2♀♀. Golestan, 8.V. 2012, 2♀♀. Entezar, 3.V.2012, 1♀. Jannat, 25.V.2012, 1♀. Shaghayegh, 19.V.2012, 1♀.

F o o d p l a n t s : *Zinnia elegans* (Asteraceae), *Gaillardia grandiflora* (Asteraceae), *Calendula persica* (Asteraceae), *Leucanthemum maximum* (Asteraceae), *Antirrhinum majus* (Scrophulariaceae), *Gomphrena globosa* (Amaranthaceae)

***Halictus pollinosus* SICHEL**

M a t e r i a l e x a m i n e d : Besat, 27.VII.2011, 1♀. Shaghayegh, 19.V.2012, 2♀♀. Jannat, 26.V.2012, 1♀. Eram, 2.VI.2012, 1♀.

F o o d p l a n t s : *Gomphrena globosa* (Amaranthaceae), *Dianthus barbatus* (Caryophyllaceae), *Antirrhinum majus* (Scrophulariaceae).

***Halictus cephalicus* MORAWITZ**

M a t e r i a l e x a m i n e d : Besat, 23.VII.2011, 1♀. Shaghayegh, 25.VIII.2011, 2♀♀. Eram, 5.VIII.2012, 1♀. Afif Abad, 6.VIII.2012, 1♀.

F o o d p l a n t s : *Gomphrena globosa* (Amaranthaceae).

***Halictus lucidipennis* SMITH**

M a t e r i a l e x a m i n e d : Jannat, 25.VIII.2011, 8♀♀. Besat, 27.VIII.2011, 5♀♀. Shaghayegh, 4.IX.2011, 7♀♀. Besat, 22.VII.2012, 5♀♀. Entezar, 3.V.2012, 1♀. Jannat, 25.V.2012, 1♀. Eram, 22.VII.2012, 5♀♀. Afif Abad, 6.VIII.2012, 8♀♀. Eram, 29.VII.2012, 5♀♀.

F o o d p l a n t s : *Portulaca grandiflora* (Portulacaceae), *Gomphrena globosa* (Amaranthaceae), *Leucanthemum maximum* (Asteraceae), *Ageratum houstonianum* (Asteraceae), *Rosa* spp. (Rosaceae), *Rosmarinus officinalis* (Lamiaceae), *Calendula persica* (Asteraceae), *Zinnia elegans* (Asteraceae), *Gaillardia grandiflora* (Asteraceae), *Gazania pinata* (Sateraceae).

***Lasioglossum (Evyllaesus) harputicum* EBMER**

M a t e r i a l e x a m i n e d : Golestan, 26.VII.2011, 3♀♀.Entezar, 31.VII.2011, 3♀♀. Azadi, 24.VIII.2011, 3♀♀. Jannat, 25.VIII.2011, 10♀♀. Entezar, 27.VIII.2011, 10♀♀. Jahan Nama, 5.IX.2011, 27♀♀. Besat, 27.VIII.2011, 25♀♀. Shaghayegh, 4.IX.2011, 40♀♀. Razavi, 19.VII.2011, 3♀♀. Jahan Nama, 19.IX.2011, 7♀♀. Jahan Nama, 21.IX.2011, 5♀♀. Besat, 22.VII.2012, 10♀♀. Eram, 2.VI.2012, 1♀. Besat, 30.V.2012, 1♀. Entezar, 29.V.2012, 4♀♀. Eram, 26.V.2012, 1♀. Jannat, 25.V.2012, 2♀♀. Delgosha, 21.V.2012, 3♀♀. Shaghayegh, 19.V.2012, 2♀♀. Jahan Nama, 28.VII.2012, 8♀♀. Jahan Nama, 21.VII.2012, 18♀♀. Afif Abad, 23.VII.2012, 7♀♀. Afif Abad, 30.VII.2012, 10♀♀. Eram, 22.VII.2012, 5♀♀. Afif Abad, 6.VIII.2012, 7♀♀. Jahan Nama, 4.VIII.2012, 20♀♀. Eram, 5.VIII.2012, 6♀♀. Jahan Nama, 11.VIII.2012, 7♀♀. Eram, 12.VIII.2012, 5♀♀. Afif Abad, 13.VIII.2012, 10♀♀.

Food plants: *Portulaca grandiflora* (Portulacaceae), *Gomphrena globosa* (Amaranthaceae), *Leucanthemum maximum* (Asteraceae), *Ageratum houstonianum* (Asteraceae), *Rosa* spp. (Rosaceae), *Rosmarinus officinalis* (Lamiaceae), *Calendula persica* (Asteraceae), *Zinnia elegans* (Asteraceae), *Gaillardia grandiflora* (Asteraceae), *Gazania pinata* (Sateraceae).

***Lasioglossum (Evylaeus) malachurum* KIRBY**

Material examined: Jannat, 25.VIII.2011, 5 ♀♀. Besat, 27.VIII.2011, 4 ♀♀. Besat, 21.IV.2012, 6 ♀♀. Jannat, 25.V.2012, 9 ♀♀. Besat, 30.V.2012, 5 ♀♀. Delgosha, 21.V.2012, 12 ♀♀. Eram, 30.IV.2012, 14 ♀♀. Entezar, 3.V.2012, 2 ♀♀. Shaghayegh, 19.V.2012, 4 ♀♀. Eram, 2.VI.2012, 5 ♀♀. Eram, 8.IV.2012, 9 ♀♀. Afif Abad, 22.IV.2012, 18 ♀♀. Eram, 30.V.2012, 1 ♀. Golestan, 8.V.2012, 3 ♀♀. Entezar, 15.V.2012, 4 ♀♀. Eram, 26.V.2012, 2 ♀♀. Entezar, 29.V.2012, 5 ♀♀.

Food plants: *Antirrhinum majus* (Scrophulariaceae), *Anemone coronaria* (Renunculaceae), *Dianthus barbatus* (Caryophyllaceae), *Gaillardia grandiflora* (Asteraceae), *Calendula persica* (Asteraceae), *Rosa* spp. (Rosaceae), *Viola* spp. (Violaceae), *Zinnia elegans* (Asteraceae), *Senecio cineraria* (Asteraceae), *Ageratum houstonianum* (Asteraceae).

***Lasioglossum (Evylaeus) marginatum* BRULLÉ**

Material examined: Besat, 23.VII.2011, 1 ♀. Besat, 21.IV.2012, 10 ♀♀. Jannat, 25.v.2012, 8 ♀♀. Delgosha, 21.V.2012, 7 ♀♀. Eram, 30.IV.2012, 3 ♀♀. Shaghayegh, 19.V.2012, 3 ♀♀. Eram, 8.IV.2012, 4 ♀♀. Afif Abad, 22.IV.2012, 3 ♀♀. Golestan, 8.V.2012, 1 ♀. Eram, 26.V.2012, 10 ♀♀. Entezar, 29.V.2012, 1 ♀.

Food plants: *Antirrhinum majus* (Scrophulariaceae), *Anemone coronaria* (Renunculaceae), *Dianthus barbatus* (Caryophyllaceae), *Gaillardia grandiflora* (Asteraceae), *Calendula persica* (Asteraceae), *Rosa* spp. (Rosaceae), *Viola* spp. (Violaceae), *Zinnia elegans* (Asteraceae), *Senecio cineraria* (Asteraceae), *Ageratum houstonianum* (Asteraceae).

***Lasioglossum (Evylaeus) lineare* SCHENCK**

Material examined: Afif Abad, 29.V.2012, 2 ♂♂. Afif Abad, 23.VII.2012, 4 ♂♂.
Food plants: *Verbena hybrida* (Verbenaceae), *Gomphrena globosa* (Amaranthaceae), *Calendula persica* (Asteraceae).

***Lasioglossum (Evylaeus) pilosum* SMITH**

Material examined: Razavi, 19.VII.2012, 3 ♀♀. Jahan Nama, 21.VII.2012, 1 ♀.

Food plants: *Zinnia elegans* (Asteraceae).

***Pseudapis (Pseudapis) lobata* OLIVIER**

Material examined: Besat, 23.VII.2011, 1 ♂. Jahan Nama, 21.VII.2012, 3 ♂♂. Jahan Nama, 4.VIII.2012, 2 ♂♂. Jahan Nama, 28.VII.2012, 3 ♂♂. Eram, 29.VII.2012, 3 ♂♂. Eram, 22.VII.2012, 1 ♂. Eram, 12.VIII.2012, 1 ♂.

Food plants: *Calendula persica* (Asteraceae), *Zinnia elegans* (Asteraceae), *Celosia* sp. (Amarantaceae).

***Pseudapis (Nomiapis) diversipes* LATREILLE**

M a t e r i a l e x a m i n e d : Besat, 23.VII.2011, 4♀♀. Jannat, 25. VIII.2011, 2♀♀. Besat, 27.VIII.2011, 7♀♀, 1♂. Eram, 12.VIII.2012, 13♀♀, 5♂♂. Eram, 29.VII.2012, 10♀♀, 4♂♂. Afif Abad, 13.VIII.2012, 1♀. Jahan Nama, 11.VIII.2012, 1♀. Afif Abad, 23.VII.2012, 2♀♀. Eram, 22.VII.2012, 5♀♀. Eram, 5.VIII.2012, 8♀♀. Jahan Nama, 4.VIII.2012, 2♀♀. Afif Abad, 6.VIII.2012, 3♂♂. Jannat, 25.V.2012, 1♀, 1♂.

F o o d p l a n t s : *Calendula persica* (Asteraceae), *Zinnia elegans* (Asteraceae), *Verbena hybrida* (Verbenaceae), *Dianthus barbatus* (Caryophyllaceae), *Gaillardia grandiflora* (Asteraceae), *Gomphrena globosa* (Amaranthaceae), *Celosia* sp. (Amarantaceae).

***Pseudapis (Pseudapis) edentata* MORAWITZ**

M a t e r i a l e x a m i n e d : Jahan Nama, 21.VII.2012, 2♂♂. Eram, 22.VII.2012, 4♂♂. Eram, 29.VII.2012, 4♂♂. Eram, 5.VIII.2012, 5♂♂.

F o o d p l a n t s : *Zinnia elegans* (Asteraceae), *Gomphrena globosa* (Amaranthaceae), *Celosia* sp. (Amarantaceae).

***Sphecodes puncticeps* THOMSON**

M a t e r i a l e x a m i n e d : Delgosha, 21.V.2012, 1♂.

F o o d p l a n t s : *Calendula persica* (Asteraceae).

Family M e g a c h i l i d a e

***Megachile (Eutricharaea) apicalis* SPINOLA**

M a t e r i a l e x a m i n e d : Eram, 26.V.2012, 1♀. Eram, 22.VII.2012, 1♀.

F o o d p l a n t s : *Ageratum houstonianum* (Asteraceae).

***Megachile (Eutricharaea) picicornis* MORAWITZ**

M a t e r i a l e x a m i n e d : Afif Abad, 13.VIII.2012, 1♀. Afif Abad, 6.VIII.2012, 1♀. Afif Abad, 23.VII.2012, 2♂♂. Jahan Nama, 21.VII.2012, 1♂.

F o o d p l a n t s : *Zinnia elegans* (Asteraceae), *Senecio cineraria* (Asteraceae), *Calendula persica* (Asteraceae).

***Megachile (Eutricharaea) anatolica* REBMANN**

M a t e r i a l e x a m i n e d : Jannat, 25.VIII.2011, 2♀♀, 5♂♂. Besat, 27.VIII.2011, 3♀♀, 24.VIII.2011, 1♂. Besat, 23.VII.2011, 5♂♂. Shaghayegh, 4.IX.2011, 1♂. Jahan Nama, 5.IX.2011, 2♀♀. Jahan Nama, 19.IX.2011, 1♀. Delgosha, 21.V.2012, 4♀♀, 3♂♂. Delgosha, 27.V.2012, 1♀, 2♂♂. Entezar, 29.V.2012, 1♀, 1♂. Eram, 2.VI.2012, 1♀, 5♂♂. Jahan Nama, 21.VII.2012, 1♀. Azadi Shaghayegh, 19.V.2012, 1♂. Eram, 26.V.2012, 6♂♂. Eram, 10.V.2012, 1♂. Eram, 22.VII.2012, 3♂♂. Besat, 30.V.2012, 1♂.

F o o d p l a n t s : *Portulaca grandiflora* (Portulacaceae), *Leucanthemum maximum* (Asteraceae), *Calendula persica* (Asteraceae), *Antirrhinum majus* (Scrophulariaceae), *Gaillardia grandiflora* (Asteraceae), *Gomphrena globosa* (Amaranthaceae), *Celosia* sp. (Amarantaceae), *Rosmarinus officinalis* (Lamiaceae), *Gazania pinata* (Sateraceae), *Ageratum houstonianum* (Asteraceae).

***Megachile (Eutricharaea) fertoni* PÉREZ**

M a t e r i a l e x a m i n e d : Azadi, 24.VIII.2011, 27 ♀♀. Jannat, 25.VIII.2011, 23 ♀♀. Besat, 27.VIII.2011, 19 ♀♀. Shaghayegh, 4.IX.2011, 5 ♀♀. Jahan Nama, 5.IX.2011, 9 ♀♀. Jahan Nama, 21.IX.2011, 7 ♀♀. Besat, 23.VII.2011, 1 ♀. Eram, 22.VII.2012, 21 ♀♀, 4 ♂♂. Afif Abad, 23.VII.2012, 4 ♀♀, 3 ♂♂. Jahan Nama, 28.VII.2012, 3 ♀. Afif Abad, 6.VIII.2012, 21 ♀♀, 11 ♂♂. Jahan Nama, 11.VIII.2012, 9 ♀♀, 1 ♂. Jahan Nama, 4.VIII.2012, 8 ♀♀. Eram, 5.VIII.2012, 9 ♀♀, 1 ♂. Afif Abad, 30.VII.2012, 3 ♀♀, 9 ♂♂. Etam, 29.VII.2012, 23 ♀♀, 2 ♂♂. Afif Abad, 13.VIII.2012, 14 ♀♀, 4 ♂♂. Eram, 12.VIII.2012, 27 ♀♀, 4 ♂♂. Golestan, 8.V.2012, 1 ♀. Entezar, 3.V.2012, 1 ♀. Shaghayegh, 19.V.2012, 1 ♀. Delgosha, 21.V.2012, 2 ♀♀, 1 ♂. Jannat, 25.V.2012, 1 ♀. Delgosha, 27.V.2012, 1 ♀. Entezar, 29.V.2012, 2 ♀♀. Eram, 2.VI.2012, 2 ♀♀.

F o o d p l a n t s : *Antirrhinum majus* (Scrophulariaceae), *Calendula persica* (Asteraceae), *Gaillardia grandiflora* (Asteraceae), *Zinnia elegans* (Asteraceae), *Rosa* spp. (Rosaceae), *Leucanthemum maximum* (Asteraceae), *Portulaca grandiflora* (Portulacaceae), *Gomphrena globosa* (Amaranthaceae), *Ageratum houstonianum* (Asteraceae).

***Megachile (Eutricharaea) minutissima* RADOSZKOWSKI**

M a t e r i a l e x a m i n e d : Besat, 27.VIII.2011, 5 ♀♀. Besat, 23.VII.2011, 2 ♀♀. Jannat, 25.VIII.2011, 1 ♀. Shaghayegh, 19.V.2011, 2 ♀♀. Eram, 2.VII.2012, 1 ♀. Jahan Nama, 21.VII.2012, 1 ♀. Eram, 12.VII.2012, 1 ♀. Jahan Nama, 4.VIII.2012, 1 ♀.

F o o d p l a n t s : *Calendula persica* (Asteraceae), *Rosa* spp. (Rosaceae), *Gomphrena globosa* (Amaranthaceae), *Leucanthemum maximum* (Asteraceae), *Zinnia elegans* (Asteraceae), *Celosia* sp. (Amaranthaceae), *Portulaca grandiflora* (Portulacaceae).

***Megachile (Pseudomegachile) farinosa* SMITH**

M a t e r i a l e x a m i n e d : Besat, 27.VIII.2011, 1 ♂. Eram, 5.VIII.2012, 1 ♂.

F o o d p l a n t s : *Gomphrena globosa* (Amaranthaceae), *Ageratum houstonianum* (Asteraceae).

***Anthidiellum (Anthidiellum) strigatum* PANZER**

M a t e r i a l e x a m i n e d : Besat, 27.VIII.2011, 1 ♀.

F o o d p l a n t s : *Gomphrena globosa* (Amaranthaceae).

***Anthidium (Anthidium) florentinum* FABRICIUS**

M a t e r i a l e x a m i n e d : Afif abad, 6.VIII.2012, 1 ♂. Eram, 5.VIII.2012, 5 ♀♀, 4 ♂♂. Jahan Nama, 4.VIII.2012, 2 ♀♀, 4 ♂♂. Eram, 29.VII.2012, 6 ♀♀, 5 ♂♂. Eram, 12.VIII.2012, 6 ♀♀, 4 ♂♂. Jahan Nama, 21.VII.2012, 4 ♀♀, 3 ♂♂. Afif Abad, 23.VII.2012, 1 ♂. Eram, 22.VII.2012, 4 ♀♀, 10 ♂♂. Jahan Nama, 11.VIII.2012, 1 ♀. Delgosha, 21.V.2012, 4 ♂♂. Jannat, 25.V.2012, 3 ♀♀, 1 ♂. Eram, 26.V.2012, 1 ♂. Delgosha, 27.V.2012, 1 ♀, 4 ♂♂. Entezar, 29.V.2012, 1 ♀, 1 ♂. Besat, 30.V.2012, 4 ♀♀.

F o o d p l a n t s : *Calendula persica* (Asteraceae), *Senecio cineraria* (Asteraceae), *Zinnia elegans* (Asteraceae), *Gomphrena globosa* (Amaranthaceae), *Gaillardia grandiflora* (Asteraceae), *Antirrhinum majus* (Scrophulariaceae), *Leucanthemum maximum* (Asteraceae), *Ageratum houstonianum* (Asteraceae).

***Osmia (Helicosmia) signata* ERICHSON**

M a t e r i a l e x a m i n e d : Golestan, 8.V.2012, 2 ♀♀.

F o o d p l a n t s : *Calendula persica* (Asteraceae).

Family *A n d r e n i d a e*

Andrena (Zonandrena) flavipes PANZER

Material examined: Eram, 2.VI.2012, 1♀. Afif Abad, 22.IV.2012, 1♀.

Food plants: *Calendula persica* (Asteraceae), *Leucanthemum maximum* (Asteraceae).

Andrena (Ptilandrena) vetula LEPELETIER

Material examined: Afif Abad, 23.VII.2012, 3♀.

Food plants: *Calendula persica* (Asteraceae).

Discussion

KHODAPARAST & MONFARED (2012) collected 3.128 bee pollinating Apoidea from Fars province. Their sampling area were of horticultural crops, crops, ornamental flowers, weeds and pasture plants. Through their specimens there were 177 bees species which 91 species were new records for Iran's fauna and also seven species were new for science. IZADI et al. (1996), collected bees from north of the Fars province. In their study, 35 species belonging to 7 families and 19 genera were recorded. In present study 31 species collected from green area through Shiraz city which all be recorded in previous studies. It is believed that urban parks acts such as habitable islands for insects through the cities. Urban parks surrounded by a sea of technology act (FEATH & KANE 1978). Large urban areas, such as industrial areas, ports, airports, railways, highways, trunks loading areas, sports complexes, shopping malls, etc., are remained vital area for insects (WITTIG 1989). In order to protect bees species in the cities, one of the major factors and very important is planting, maintenance and proliferation of native and non-toxic plants species for insects (PYSEK 1993). Medium sized park in an urban environment is restricted by buildings, monuments and roads, forming a unique ecosystem that small groups of trees and shrubs and other organisms can live together. Insects such as butterflies, bees, and other arthropods such as spiders and worms and also terrestrial birds and rabbits, and other animals can gradually come into this seminatural areas. Several studies have shown that some species of bumblebees have the ability to live in settlements manipulated by man (KLEMM 1996; GULSON et al., 2002; GULSON 2003). Minimum needed for some bees to survive in urban green areas are: 1. Places to build nests, 2. Substances that can build their nests and 3. Nectar and pollen from flowers (WESTRICH 1996). Studies suggested the value of urban parks and green spaces for wildlife pollinators. For example, in a San Francisco park diverse species of Bumblebees lives in such areas (MCFREDERICK & LEBUHN 2006). This is the first study about urban pollinators in Iran. In this study it was found that pollinator bees are able to overcome numerous physical and non- physical barriers to reach to flowering plants in urban parks. Recent studies shown a high density of insects in some cities, such as London and Rome (Owen and OWEN 1975; ZAPPAROLI 1997). In Berlin, Germany, half of the bee fauna of Germany, were discovered in a town areas (KUHNS et al. 2005). In urban areas, more than 1.600 species of California native pollinator wasps have been observed in over of 6.000 species of native plants (FRANKIE et al, 2009). Plant gardens and urban green spaces should be designed to attract and provide nectar and pollen for bees. Since cities are expanding fastly and this means fast destruction for natural green area where pollinators live, we

should compensate these dangerous aspect with expanding green area and gardens through cities to protect most of pollinator specis.

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