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A faunistic study on leafcutting bees (Hymenoptera: Apoidea: Megachilidae) from some regions of Iran.

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Abstract: This paper deals with the fauna of two subfamilies (Megachilinae and Pararhophitinae) of leafcutting bees (Hymenoptera: Apoidea: Megachilidae) from different regions of Iran. In total 23 species belonging to 11 genera, *Anthidium* Fabricius, 1805, *Coelioxys* Latreille, 1809, *Heriades* Spinola, 1808, *Hoplitis* Klug, 1807, *Lithurgus* Berthold, 1827, *Megachile* Latreille, 1802, *Osmia* Panzer, 1806, *Pararhophites* Friese, 1898, *Pseudoheriades* Peters, 1970, *Stelis* Panzer, 1806, and *Trachusa* Panzer, 1804 were collected and identified.

Key words: Hymenoptera, Apoidea, Megachilidae, leafcutting bees, fauna, Iran.

Resumen: Estudio faunístico sobre los megaquilidos (Hymenoptera: Apoidea: Megachilidae) de algunas regiones de Irán. Este trabajo trata sobre la fauna dos subfamilias (Megachilinae y Pararhophitinae) de megaquilidos (Hymenoptera: Apoidea: Megachilidae) de algunas regiones de Irán. En total, fueron capturadas e identificadas 23 especies pertenecientes a 11 géneros, *Anthidium* Fabricius, 1805, *Coelioxys* Latreille, 1809, *Heriades* Spinola, 1808, *Hoplitis* Klug, 1807, *Lithurgus* Berthold, 1827, *Megachile* Latreille, 1802, *Osmia* Panzer, 1806, *Pararhophites* Friese, 1898, *Pseudoheriades* Peters, 1970, *Stelis* Panzer, 1806 y *Trachusa* Panzer, 1804.

Palabras clave: Hymenoptera, Apoidea, Megachilidae, megaquilidos, fauna, Irán.

Recibido: 28 de octubre de 2015
Aceptado: 6 de noviembre de 2015

Publicado on-line: 18 de noviembre de 2015

Introduction

Bees (Hymenoptera) are beneficial insects and essential in most terrestrial natural communities because of the pollination services they provide to plants (Roig-Juñent 2008). Leafcutting bees (Hymenoptera: Megachilidae), with more than 4000 described species worldwide (Michener 2007), are common insects throughout the world and powerful pollinators of various plants (Raw 2004; Pitts-Singer & Cane 2011). The most important plant-megachilid associations are *Medicago sativa*, *Trifolium* sp., *Onobrychis sativa*, *Cerasus ovium*, *Amygdalus communis*, and *Malus orientalis* (Frohlich 1990; Bosch & Blas 1994; Vicens & Bosch 2000; Güler & Çağatay 2006). Some megachilid species can be used as a commercial species when a decrease is observed in the primary pollinator belonging to any other family (Richards 1997). Vicens & Bosch (2000) observed that *O. cornuta* was much more effective in contrast to *Apis mellifera* Linnaeus, 1761 in terms of visited flowers, mean pollen gathering activity and mobility in apple tree (*Malus domestica* Borkh). All leafcutting bees are solitary and the most of them nest in pre-existing cavities in the ground, wood, stems, or even arboreal termite nests (Torretta et al. 2012).

The fauna of Iranian Megachilidae has been studied quite well and several papers were published by Popov (1967), Esmaili & Rastegar (1974), Warncke (1981), Ebadi (1995), Talebi et al. (1995), Modarres

Awal (1997), Izadi et al. (1998, 1999, 2000, 2004, 2006), Karimpour et al. (2002), Engel (2006), Tavakkoli et al. (2010), Khaghaninia et al. (2010), Khodaparast et al. (2011), Monfared & Khodaparast (2012), Rasekh Adel et al. (2012a, b, c), Salehi Sarbijan et al. (2012), Soraya Mohtat et al. (2012), Keshtkar et al. (2012, 2015), Khodaparast & Monfared (2012, 2013), Monfared et al. (2012), Samin et al. (2014), and Nadimi et al. (2013a, b, 2014). The aim of this paper is determining the species diversity of Megachilidae collected in different regions of Iran.

Material and methods

The materials were collected by sweeping net and Malaise traps in some regions of Iran. The specimens collected were placed in ordinary paper envelopes after being killed with cyanid, and then placed in a desiccator to prepare them for morphological study. The specimens were pinned and labeled according to current taxonomic rules and were examined with a stereomicroscope. Additionally, many specimens were obtained from some insect collections and their data are also used in this paper. For identification of genera and species, the keys developed by Osychnyuk et al. (1978), Dorn & Weber (1988), Warncke (1980, 1992), Banaszak & Romasenko (1998), Michener (2007) and Amiet et al. (2004) were used. The classification of the different taxa follows Michener (2007). All the valid names are listed alphabetically within their tribes and genera.

Results

In total, 23 megachilid species from 2 subfamilies (Megachilinae and Pararhophitinae) and 11 genera (*Anthidium* Fabricius, 1805, *Coelioxys* Latreille, 1809, *Heriades* Spinola, 1808, *Hoplitis* Klug, 1807, *Lithurgus* Berthold, 1827, *Megachile* Latreille, 1802, *Osmia* Panzer, 1806, *Pararhophites* Friese, 1898, *Pseudoheriades* Peters, 1970, *Stelis* Panzer, 1806, and *Trachusa* Panzer, 1804) are listed in this faunistic paper. The list of species is given below alphabetically with local distribution data.

Family Megachilidae Latreille, 1802

Subfamily Megachilinae Latreille, 1802

Tribe Anthidiini Ashmead, 1899

Genus *Anthidium* Fabricius, 1805

Anthidium affine Morawitz, 1873

Material examined: Province of Markazi: Saveh, 35°06'N 49°59'E, 1♀, X.2009.

Distribution in Iran: Fars (Esmaili & Rastegar 1974).

Anthidium dalmaticum Mocsáry, 1884

Material examined: Province of Isfahan: Kashan, 34°00'N 51°20'E, 1♂, VIII.2012.

Distribution in Iran: Tehran (Esmaili & Rastegar 1974).

Anthidium diadema (Latreille, 1809)

Material examined: Province of Markazi: Saveh, 35°06'N 49°59'E, 1♀, X.2009.

Distribution in Iran: Khorasan (Rasekh Adel et al. 2012a, b, c).

Plant association: This species was collected in alfalfa and onion fields (Rasekh Adel et al. 2012b, c).

***Anthidium (Anthidium) strigatum* (Panzer, 1805)**

Material examined: Province of Guilan: Rudsar, 36°42'N 50°18'E, 1♂, 2♀♀, VI.2007.

Distribution in Iran: Alborz, Kermanshah (Esmaili & Rastegar 1974), Fars (Keshtkar *et al.* 2012), Iran (no locality cited) (Izadi *et al.* 2006).

Genus *Stelis* Panzer, 1806***Stelis scutellaris* Morawitz, 1894**

Material examined: Province of Kerman: Jiroft, 28°50'N 57°35'E, 1♂, IV.2010.

Distribution in Iran: Sistan & Baluchestan (Soraya Mohtat *et al.* 2012).

Genus *Trachusa* Panzer, 1804***Trachusa pubescens* (Morawitz, 1872)**

Material examined: Province of Isfahan: Kashan, 34°00'N 51°20'E, 1♂, 2♀♀, VIII.2012.

Distribution in Iran: Kuhgiluyeh and Boyerahmad (Monfared *et al.* 2012), Tehran (Esmaili & Rastegar 1974).

Tribe Lithurgini Newman, 1834**Genus *Lithurgus* Berthold, 1827*****Lithurgus tibialis* Morawitz, 1875**

Material examined: Province of Mazandaran: Babol, 36°30'N 52°35'E, 1♀, X.2009.

Distribution in Iran: Alborz (Talebi *et al.* 1995).

Tribe Megachilini Latreille, 1802**Genus *Coelioxys* Latreille, 1809*****Coelioxys haemorrhoea* Förster, 1853**

Material examined: Province of Kurdistan: Qorveh, 35°15'N 47°40'E, 1♀, VIII.2013.

Distribution in Iran: Guilan (Tavakkoli *et al.* 2010).

Genus *Megachile* Latreille, 1802***Megachile (Creightonella) albisecta* (Klug, 1817)**

Material examined: Province of Northern Khorasan: Quchan, 37°09'N 58°34'E, 1♂, 1♀, IX.2011.

Distribution in Iran: Kuhgiluyeh and Boyerahmad (Monfared *et al.* 2012).

***Megachile (Megachile) centuncularis* (Linnaeus, 1758)**

Material examined: Province of Semnan: Shahrood, 35°30'N 55°30'E, 1♂, IV.2012.

Distribution in Iran: Fars (Khodaparast *et al.* 2011; Khodaparast & Monfared 2012).

Plant association: *Medicago sativa* Linnaeus (Fabaceae), *Euphorbia* sp. (Euphorbiaceae), *Epilobium hirsutum* (Onagraceae) (Khodaparast & Monfared 2012).

***Megachile (Eutricharaea) fertoni* Pérez, 1895**

Material examined: Province of Southern Khorasan: Birjand, 32°32'N 58°50'E, 2♂♂, 1♀, VII.2009.

Distribution in Iran: Fars (Khodaparast et al. 2011; Khodaparast & Monfared 2012; Keshtkar et al. 2012).

Plant association: *Vitex agnus-castus* Linnaeus (Lamiaceae) (Khodaparast & Monfared 2012).

***Megachile (Pseudomegachile) rubripes* Morawitz, 1875**

Material examined: Province of Lorestan: Dorud, 33°30'N 49°05'E, 1♂, 2♀♀, VII.2010. Province of Hamadan: Malayer, 34°20'N 48°45'E, 1♂, ix.2010.

Distribution in Iran: Alborz (Talebi et al. 1995, as *Chalicodoma rubripes* (Morawitz, 1875), Fars (Izadi et al. 1998, 1999 as *Chalicodoma rubripes*; Khodaparast & Monfared 2012), Kerman (Salehi Sarbijan et al. 2012).

Plant association: *Echinops* sp. (Asteraceae), *Vitex agnus-castus* Linnaeus (Lamiaceae) (Khodaparast & Monfared 2012).

Tribe Osmiini Newman, 1834

Genus *Heriades* Spinola, 1808

***Heriades (Michenerella) hissaricus* Popov, 1955**

Material examined: Province of Sistan & Baluchestan: Nik Shahr, 26°15'N 60°00'E, 2♀♀, V.2013.

Distribution in Iran: Fars (Khodaparast & Monfared 2013).

Plant association: *Vitex agnus-castus* Linnaeus (Lamiaceae) (Khodaparast & Monfared 2013).

Genus *Hoplitis* Klug, 1807

***Hoplitis acuticornis* (Dufour & Perris, 1840)**

Material examined: Province of Semnan: Shahrood, 35°30'N 55°30'E, 1♀, IV.2012.

Distribution in Iran: Kuhgiluyeh & Boyerahmad (Monfared et al. 2012).

***Hoplitis (Pentadentoscma) rufopicta* (Morawitz, 1875)**

Material examined: Province of Northern Khorasan: Bojnord, 37°35'N 57°20'E, 2♂♂, 2♀♀, IX.2011.

Distribution in Iran: Fars (Khodaparast et al. 2011; Khodaparast & Monfared 2012, 2013), Kerman (Salehi Sarbijan et al. 2012).

Plant association: *Centaurea* sp. (Asteraceae) (Khodaparast & Monfared 2012, 2013).

Genus *Osmia* Panzer, 1806

***Osmia atrocaerulea* Schilling, 1849**

Material examined: Province of Northern Khorasan: Quchan, 37°09'N 58°34'E, 2♂♂, IX.2011.

Distribution in Iran: Guilan (Tavakkoli et al. 2010).

***Osmia (Hemiosmia) difficilis* Morawitz, 1875**

Material examined: Province of Razavi Khorasan: Mashhad, 36°17'N 59°40'E, 2♂♂, IX.2011.

Distribution in Iran: Fars (Khodaparast & Monfared 2012, 2013).

Plant association: *Vicia* sp. (Fabaceae), *Borago officinalis* Linnaeus (Boraginaceae) (Khodaparast & Monfared 2012, 2013).

***Osmia (Helicosmia) fasciata* Latreille, 1811**

Material examined: Province of Kurdistan: Qorveh, 35°15'N 47°40'E, 1♀, VIII.2013.

Distribution in Iran: Fars (Khodaparast & Monfared 2012, 2013), Kerman (Salehi Sarbijan *et al.* 2012).

Plant association: *Astragalus* sp. (Fabaceae), *Amygdalus eburnean* Linnaeus, *Amygdalus* sp. (Rosaceae) (Khodaparast & Monfared 2012, 2013).

***Osmia (Odontanthocopa) ligurica* Morawitz, 1868**

Material examined: Province of Razavi Khorasan: Mashhad, 36°17'N 59°40'E, 1♂, 1♀, IX.2011.

Distribution in Iran: Fars (Khodaparast *et al.* 2011; Khodaparast & Monfared 2012, 2013).

Plant association: *Astragalus* sp. (Fabaceae) (Khodaparast & Monfared 2012), *Medicago sativa* Linnaeus (Fabaceae), *Brassica* sp. (Brassicaceae) (Khodaparast & Monfared 2013).

***Osmia rufa* (Linnaeus, 1758)**

Material examined: Province of Kurdistan: Bijar, 35°52'N 47°36'E, 2♂♂, VIII.2013.

Distribution in Iran: Guilan (Tavakkoli *et al.* 2010), Mazandaran (Esmaili & Rastegar 1974).

***Osmia subcornuta* Morawitz, 1875**

Material examined: Province of Lorestan: Dorud, 33°30'N 49°05'E, 1♀, VII.2010.

Distribution in Iran: Kerman (Salehi Sarbijan *et al.* 2012).

Genus *Pseudoheriades* Peters, 1970***Pseudoheriades (Pseudoheriades) grandiceps* Peters, 1988**

Material examined: Province of Northern Khorasan: Bojnord, 37°35'N 57°20'E, 1♂, IX.2011.

Distribution in Iran: Sistan and Baluchestan (Ungricht *et al.* 2008).

Subfamily Pararhophitinae Popov, 1949**Genus *Pararhophites* Friese, 1898*****Pararhophites orobinus* (Morawitz, 1876)**

Material examined: Province of Northern Khorasan: Quchan, 37°09'N 58°34'E, 1♂, 1♀, IX.2011.

Distribution in Iran: Sistan and Baluchestan (Soraya Mohtat *et al.* 2012).

Acknowledgements

The authors are grateful to N.S. Gadallah (Egypt) and C. Eardley (South Africa) for editing the manuscript, to H. Sakenin and J. Rastegar (Iran) for loaning some specimens, and to A.R. Monfared (Iran), A. Müller (Switzerland), S. Ungricht (Switzerland), and J. Straka (Czech Republic) for providing some papers. The research was supported by Islamic Azad University (Young Researchers and Elite Club, and Yadegar - e- Imam Khomeini (RAH) Branch), and Nigde University.

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