



A faunistic study on Megachilidae (Hymenoptera: Apoidea) of Northern Iran

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Abstract:

In this faunistic research, totally 24 species of Megachilidae (Hymenoptera) from 8 genera *Anthidium* Fabricius, 1805, *Chelostoma* Latreille, 1809, *Coelioxys* Latreille, 1809, *Haetosmia* Popov, 1952, *Hoplitis* Klug, 1807, *Lithurgus* Berthold, 1827, *Megachile* Latreille, 1802, *Osmia* Panzer, 1806 were collected and identified from different regions of Iran. Two species are new records for the fauna of Iran: *Coelioxys (Coelioxys) aurolimbata* Förster, 1853, and *Megachile (Eutricharaea) apicalis* Spinola, 1808.

Introduction

Megachilidae (Hymenoptera) with more than 4000 described species worldwide (Michener, 2007) is a large family of specialized, morphologically rather uniform bees found in a wide diversity of habitats on all continents except Antarctica, ranging from lowland tropical rain forests to deserts to alpine environments (Litman *et al.*, 2011). The front wings without exception have got two marginal cells, and the stigma is small. The pollen-collecting scopa of all nonparasitica females is located on the abdominal sterna (Stephen *et al.*, 1969 and Özbek and van der Zanden, 1992). It has been reported that some species

belonging to the Megachilidae are effective pollinators in some plants (Bosch and Blas, 1994 and Vicens and Bosch, 2000). These solitary bees are both ecologically and economically relevant; they include many pollinators of natural, urban and agricultural vegetation (Gonzalez *et al.*, 2012). Furthermore, it has been reported that the Megachilidae species can be used as a commercial species when a decrease is observed in the primary pollinator belonging to the other family (Richards, 1997 and Güler and Çağatay, 2006).

The fauna of Iranian Megachilidae has been studied rather

well and several papers were published by Popov (1967), Esmaili and Rastegar (1974), Warncke (1981), Ebadi (1995), Talebi *et al.* (1995), Modarres Awal (1997), Izadi *et al.* (1998, 1999, 2000, 2004, and 2006), Karimpour *et al.* (2002), Engel (2006), Tavakkoli *et al.* (2010), Khaghaninia *et al.* (2010), Khodaparast *et al.* (2011), Monfared and Khodaparast (2012), Rasekh Adel *et al.* (2012 a, b and c), Salehi Sarbijan *et al.* (2012), Soraya Mohtat *et al.* (2012), Keshtkar *et al.* (2012 and 2015), Khodaparast and Monfared (2012 and 2013), Monfared *et al.* (2012) and Nadimi *et al.* (2013a, b and 2014).

The aim of this research is a partial faunistic survey on Megachilidae of Golestan and Mazandaran provinces (North of Iran).

Material and methods

The specimens of this research were collected by sweeping net and Malaise traps from some regions of northern Iran (Golestan and Mazandaran provinces). The collected specimens were placed in ordinary paper envelopes after being killed with cyanid, and then placed in a desiccator to prepare them for morphological study. The materials were pinned and labeled according to current taxonomic rules and were examined with a stereomicroscope. For the determination of the genera and species, the keys developed by Osychnyuk *et al.* (1978), Dorn and Weber (1988), Warncke (1980 and 1992), Banaszak and Romasenko (1998), Scheuchl (2006), Michener (2007) and Amiet *et al.* (2004) were used. Classification of the different taxa follows Michener (2007).

Results and discussion

In this research, 24 species of Megachilidae are recorded from Golestan and Mazandaran provinces (North of Iran). Names of the valid genera within

tribes, and valid species names are listed alphabetically within genera, together with general distribution.

Family Megachilidae Latreille, 1802

Subfamily Megachilinae Latreille, 1802

Tribe Anthidiini Ashmead, 1899

Genus *Anthidium* Fabricius, 1805

1. *Anthidium (Anthidium) florentinum* (Fabricius, 1775)

Material examined: Golestan province, Minudasht, 37°10'N 55°30'E, 2♀♀, 1♂, October 2012; Mazandaran province, Sari, 36°30'N 53°30'E, 1♀, June 2013.

General distribution: Asia Minor, Caucasus, Central Asian part of the former USSR, South and Central Europe, Siberia, Syria (**Banaszak and Romasenko, 1998**), Iran (**Warncke, 1980**) and USA (**Comba and Comba 1991**).

Plant association: Polylectic (Fabaceae and Lamiaceae) (**Banaszak and Romasenko, 1998**), *Medicago sativa* (Fabaceae), *Euphorbia* (Euphorbiaceae) and *Epilobium hirsutum* (Onagraceae) (**Khodaparast and Monfared, 2012**).

Comments: This species was collected from alfalfa and onion fields, and is a dominant species in alfalfa fields (**Rasekh Adel *et al.*, 2012 b and c**).

Tribe Lithurgini Newman, 1834

Genus *Lithurgus* Berthold, 1827

2. *Lithurgus cornutus* (Fabricius, 1787)

Material examined: Golestan province, Kalaleh, 37°43'N 55°49'E, 2♀♀, July 2012.

General distribution: Iran (Warncke 1981), Asia Minor, Caucasus, Kazakhstan, North Africa, South, East and Central Europe (**Banaszak and Romasenko, 1998**), China, Greece, Hungary, Italy, Japan, Morocco, Romania, Taiwan, Turkey, the former USSR, and former Yugoslavia (**van den Zanden, 1986**).

Plant association: Oligolectic (Asteraceae) (**Banaszak and Romasenko, 1998 and Güler and Sorkun, 2007**).

Tribe Megachilini Latreille, 1802

Genus *Coelioxys* Latreille, 1809

3. *Coelioxys (Coelioxys) aurolimbata* Förster, 1853

Material examined: Mazandaran province, Savadkooh, 36°05'N 52°55'E, 1♂, August 2014.

General distribution: Caucasus, Central Asian part of the former USSR, Europe, North Africa and Turkey (**Banaszak and Romasenko, 1998**).

Comments: New record for Iran.

Genus *Megachile* Latreille, 1802

4. *Megachile (Eutricharaea) apicalis* Spinola, 1808

Material examined: Mazandaran province, Behshahr, 36°41'N 53°44'E, 2♀♀, 1♂, June 2013.

General distribution: Canada, Caucasus, Central Asian part of the former USSR, North Africa, South and Central Europe (**Banaszak and Romasenko, 1998**).

Comments: New record for Iran.

5. *Megachile (Eutricharaea) leachella* Curtis, 1828

Material examined: Mazandaran province, Ramsar, 36°47'N 50°32'E, 1♂, September 2012.

General distribution: Asia, Caucasus, Europe, North Africa, North America, Russian Far East, Siberia (**Banaszak and Romasenko, 1998**) and Iran (**Khaghaninia et al., 2010**).

Plant association: Polylectic (mainly Fabaceae) (**Banaszak and Romasenko, 1998**).

6. *Megachile (Xanthosarus) nigriventris* Schenck, 1870

Material examined: Golestan province, Kordkoy, 36°41'N 54°12'E, 1♀, 2♂♂, September 2009.

General distribution: North, South and Central Europe (**Banaszak and Romasenko, 1998**).

Plant association: Polylectic (Rosaceae, Fabaceae and Caprifoliaceae) (**Banaszak and Romasenko, 1998**).

7. *Megachile (Megachile) pilicrus* Morawitz, 1878

Material examined: Golestan province, Kordkoy, 36°41'N 54°12'E, 2♀♀, August 2009.

General distribution: Caucasus, Central Asian part of the former USSR (**Banaszak and Romasenko, 1998**), South, Eastern and Central Europe (**Comba and Comba, 1991**).

8. *Megachile (Eutricharaea) rotundata* (Fabricius, 1787)

Material examined: Mazandaran province, Savadkooh, 36°05'N 52°55'E, 4♀♀, 3♂♂, August 2014; Golestan province, Minudasht, 37°10'N 55°30'E, 1♀, 1♂, October 2012.

General distribution: Caucasus, Central Asian part of the former USSR, Europe, Far East Russia, Kazakhstan, North Africa, North and South America, New Zealand (**Comba and Comba, 1991 and Banaszak and Romasenko, 1998**), Turkey (**Özbek and van der Zanden, 1994**).

Plant association: Polylectic (Asteraceae, Fabaceae and Lamiaceae) (**Banaszak and Romasenko, 1998**).

Tribe Osmiini Newman, 1834

Genus *Chelostoma* Latreille, 1809

9. *Chelostoma (Chelostoma) emarginatum* (Nylander, 1856)

Material examined: Mazandaran province, Behshahr, 36°41'N 53°44'E, 1♀, 1♂, June 2013.

General distribution: Austria, Azerbaijan, Bulgaria, Bosnia-Herzegovina, Croatia, Czech Republic, France, Greece, Hungary, Iran, Italy, Macedonia, Portugal, Romania, Serbia

and Montenegro, Sicily, Slovakia, Slovenia, Spain, Switzerland, Turkey (Grace, 2010 and Müller, 2012).

Plant association: Oligolectic on *Ranunculus* (Ranunculaceae) and possibly also on closely related genera (Amiet et al., 2004; Sedivy et al., 2008; Grace 2010 and Müller 2012).

10. *Chelostoma* (*Gyrodromella*) *proximum* Schletterer, 1889

Material examined: Golestan province, Kalaleh, 37°43'N 55°49'E, 2♀♀, September 2012.

General distribution: Azerbaijan, Caucasus, China, Far East, Georgia, Iran, Russia, Turkmenistan, Turkey, Ukraine (Banaszak and Romasenko 1998 and Grace, 2010).

Plant association: Probably Oligolectic on Campanulaceae (Banaszak and Romasenko, 1998 and Müller, 2012).

Genus *Haetosmia* Popov, 1952

11. *Haetosmia* *vechti* (Peters, 1974)

Material examined: Mazandaran province, Savadkooh, 36°05'N 52°55'E, 1♀, 2♂♂, August 2014.

General distribution: Greece, Iran, Palestine, Turkey (Banaszak and Romasenko 1998; Grace 2010 and Müller, 2012).

Plant association: Oligolectic on *Heliotropium* (Boraginaceae) (Mavromoustakis, 1954).

Genus *Hoplitis* Klug, 1807

12. *Hoplitis* (*Hoplitis*) *adunca* (Panzer, 1798)

Material examined: Golestan province, Gorgan, 36°50'N 54°30'E, 1♀, spring 2012.

General distribution: Asia Minor, Caucasus, Central Asian part of the former USSR, North Africa (Warncke 1992; Banaszak and Romasenko, 1998 and Amiet et al., 2004), South, Eastern and Central Europe (Comba and Comba, 1991).

13. *Hoplitis* (*Hoplitis*) *flabellifera* (Morice, 1901)

Material examined: Mazandaran province, Amol, 36°28'N 52°21'E, 3♀♀, 1♂, April 2013.

General distribution: Armenia, Iran, Jordan, Palestine, Syria, Turkey (Grace, 2010 and Müller, 2012).

Plant association: Polylectic with a strong preference for *Anchusa* (Boraginaceae) (Müller, 2012), *Vicia* (Fabaceae), *Borago officinalis* (Boraginaceae), *Centuria* (Asteraceae) (Khodaparast and Monfared, 2012), *Vicia* (Asteraceae), *Borago officinalis* (Boraginaceae), *Centaurea* (Asteraceae) (Khodaparast and Monfared, 2013).

Genus *Osmia* Panzer, 1806

14. *Osmia* (*Monosmia*) *apicata* Smith, 1853

Material examined: Mazandaran province, Behshahr, 36°41'N 53°44'E, 2♀♀, June 2013.

General distribution: Albania, Armenia, Bulgaria, Croatia, Iran, Italy, Jordan, Georgia, Greece, Macedonia, Palestine, Russia, Serbia and Montenegro, Slovenia, Syria, Turkey (Grace, 2010 and Müller, 2012).

Plant association: Oligolectic on *Onosma* sp. (Boraginaceae) (Müller, 2012).

15. *Osmia* (*Osmia*) *bicornis* (Linnaeus, 1758)

Material examined: Mazandaran province, Qaemshahr, 36°28'N 52°52'E, 2♀♀, 2♂♂, August 2014.

General distribution: Algeria, Cyprus, Europe, Far Eastern Siberia, Iran, Kazakhstan, Kyrgyzstan, Morocco, Tunisia, Turkmenistan, Palestine, Syria, Turkey (Banaszak and Romasenko, 1998; Grace, 2010 and Müller 2012).

Plant association: Polylectic, prefer Rosaceae and Fabaceae (Banaszak and Romasenko, 1998 and Müller, 2012).

16. *Osmia (Metallinella) brevicornis* (Fabricius, 1798)

Material examined: Golestan province, Minudasht, 37°10'N 55°30'E, 2♂♂, October 2012.

General distribution: Algeria, Caucasus, Cyprus, Iran, Morocco, Northern Asia, South eastern- and Central-Europe, Tunisia, Turkey (**Banaszak and Romasenko, 1998; Grace, 2010; and Müller, 2012**).

Plant association: Oligolectic on Brassicaceae (**Banaszak and Romasenko, 1998 and Müller, 2012**).

17. *Osmia (Helicosmia) caerulescens* (Linnaeus, 1758)

Material examined: Mazandaran province, Sari, 36°30'N 53°30'E, 1♀, 2♂♂, June 2013.

General distribution: Algeria, Canada, China, Cyprus, Egypt, Europe, India, Iran, Jordan, Kazakhstan, Kyrgyzstan, Morocco, Syria, Tajikistan, Tunisia, Turkey, Turkmenistan, USA and Uzbekistan (**Banaszak and Romasenko, 1998; Grace, 2010 and Müller, 2012**).

Plant association: Polylectic, prefers Fabaceae, Lamiaceae, Boraginaceae and Antirrhineae (**Banaszak and Romasenko 1998; Grace, 2010 and Müller, 2012**), *Vicia* sp. (Fabaceae), *Borago officinalis* (Boraginaceae), *Medicago sativa* (Fabaceae), *Euphorbia* sp. (Euphorbiaceae), *Epilobium hirsutum* (Onagraceae) (**Khodaparast and Monfared, 2012, and 2013**).

18. *Osmia (Pyrosmia) cephalotes* Morawitz, 1870

Material examined: Mazandaran province, Amol, 36°28'N 52°21'E, 2♀♀, 1♂, April 2013; Golestan province, Gorgan, 36°50'N 54°30'E, 2♀♀, July 2009.

General distribution: Algeria, Caucasus, Cyprus, Iran, Jordan, Libya, Morocco, Palestine, South- and Eastern-

Europe, Syria, Tunisia, Turkey and Turkmenistan (**Banaszak and Romasenko, 1998; Grace, 2010 and Müller, 2012**).

Plant association: Polylectic with a preference for Fabaceae (**Banaszak and Romasenko, 1998; Grace, 2010 and Müller, 2012**), *Vicia* (Fabaceae), *Borago officinalis* (Boraginaceae) (**Khodaparast and Monfared, 2012 and 2013**).

19. *Osmia (Osmia) cornuta* (Latreille, 1805)

Material examined: Mazandaran province, Qaemshahr, 36°28'N 52°52'E, 1♀, August 2014.

General distribution: Algeria, Cyprus, Egypt, Europe, Iran, Tunisia, Turkmenistan, Turkey (**Banaszak and Romasenko, 1998; Grace, 2010 and Müller, 2012**).

Plant association: Polylectic; prefers Rosaceae (**Westrich, 1989; Banaszak and Romasenko, 1998 and Amiet et al., 2004**).

20. *Osmia (Helicosmia) dimidiata* Morawitz, 1870

Material examined: Golestan province, Gonbad, 37°30'N 55°00'E, 1♀, 2♂♂, September 2013.

General distribution: Asia minor, Caucasus, Cyprus, Iran, Morocco, Kyrgyzstan, Lebanon, Palestine, South Europe, Turkey and Turkmenistan (**Banaszak and Romasenko, 1998; Grace, 2010 and Müller, 2012**).

Plant association: Probably oligolectic on Asteraceae, visiting *Cirsium syriacum*, *Calendula persica*, *Centaurea hyalolepis*, *Statice sinuata*, *Echium sericeum*, *Scolymus hispanicus* and *Marrubium vulgare apolum* (**Grace, 2010 and Müller, 2012**).

21. *Osmia (Helicosmia) melanogaster* Spinola, 1808

Material examined: Mazandaran province, Qaemshahr, 36°28'N 52°52'E, 1♂, August 2014.

General distribution: Algeria, Caucasus, Cyprus, Egypt, Iran, Jordan, Libya, South, Eastern and Central Europe, Morocco, Palestine, Syria, Tunisia and Turkey (**Banaszak and Romasenko, 1998; Grace, 2010 and Müller, 2012**).

Plant association: Oligolectic on Carduoideae (Asteraceae) (**Müller, 2012**).

22. *Osmia (Helicosmia) niveata* (Fabricius, 1804)

Material examined: Golestan province, Gonbad, 37°30'N 55°00'E, 1♀, 1♂, September 2013.

General distribution: Cyprus, Europe, Iran, Jordan, Lebanon, Northern Africa, Palestine, Syria, Turkey, Turkmenistan (**Grace, 2010 and Müller, 2012**).

Plant association: Oligolectic on Asteraceae with a distinct preference for Carduoideae (**Westrich, 1989; Amiet et al., 2004 and Müller, 2012**).

23. *Osmia (Allosmia) rufohirta* Latreille, 1811

Material examined: Mazandaran province, Sari, 36°30'N 53°30'E, 1♀, June 2013.

General distribution: Algeria, Caucasus, China, Jordan, Morocco, South, Central and Eastern Europe, Syria, Turkmenistan, Tunisia and Turkey (**Banaszak and Romasenko, 1998; Grace, 2010 and Müller, 2012**).

Plant association: Polylectic with a preference for Fabaceae (**Banaszak and Romasenko, 1998 and Müller, 2012**).

24. *Osmia (Helicosmia) signata* Erichson, 1835

Material examined: Mazandaran province, Amol, 36°28'N 52°21'E, 2♀♀, April 2013.

General distribution: Albania, Algeria, China, Cyprus, Egypt, France, Greece, Corsica, Crete, Iran, Italy, Jordan, Morocco, Palestine, Portugal, Sardinia, Sicily, Spain, Syria, Turkey, Turkmenistan and Ukraine (**Grace, 2010 and Müller, 2012**).

Plant association: Oligolectic on Asteraceae (**Müller, 2012**).

Upon the results of this research together with other works on Megachilidae of Northern Iran (e.g. Tavakkoli *et al.*, 2010 and Nadimi *et al.*, 2013 a, b and 2014) indicate that there is a diverse fauna of these beneficial insects in northern Iran. Although the fauna of Megachilidae of southern Iran was studied rather well (see references) but the fauna of northern Iran was poorly studied so far. Regarding to the diverse flora in northern Iran, we expect much more species of Megachilidae in the mentioned area. The megachilids are important pollinators of several wildflowers, vegetables and fruits, and are used as pollinators by commercial growers of blueberries, onions, carrots and alfalfa (Bohart, 1972 and Pitts-Singer and Cane, 2011). In addition to the species diversity of Iranian Megachilidae, there are many other unknown data such as the diversity of nesting biology and floral relationships. Diverse materials are used in nest building and the inclusion of these foreign materials in nest construction may have promoted a massive range expansion and diversification within the family (Cane *et al.*, 2007; Litman *et al.*, 2011 and Gonzales *et al.*, 2012). Also, many insects (e.g. Chrysididae, Mutillidae, Formicidae, Rhipiphoridae, Meloidae, Cleridae, etc.) attack the nests of leafcutting bees (Ahmed Khattaby, 1992 and Woodward, 1994), which determining of these natural enemies can

be an interesting research work in different regions of Iran.

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