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A faunistic study on the Braconidae of Iran (Hymenoptera: Ichneumonoidea).

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Abstract: Braconid wasps (Hymenoptera: Braconidae) are natural enemies of agricultural pests and have powerful role in biological control. This paper documents 28 species belonging to 11 subfamilies (Agathidinae, Alysinae, Brachistinae, Braconinae, Cheloninae, Euphorinae, Helconinae, Macrocentrinae, Microgastrinae, Opiinae, and Rogadinae) from different parts of Iran. This work also includes the details on collection localities and zoogeographical distribution of the species.

Key words: Hymenoptera, Braconidae, faunistic study, distribution, Iran.

Recibido: 9 de abril de 2015
Aceptado: 15 de abril de 2015

Introduction

Braconidae Nees, 1811 with about 18,000 described species and estimate of 40,000-50,000 species worldwide (Yu et al. 2006), is one of the major groups of insect parasitoids that are effective enough to exert a definite regulatory impact on the increase of numerous important plant pests (Sharkey 1993; Quicke et al. 1999). Nearly all Braconidae are primary parasitoids of other insects, especially of the larval stages of Coleoptera, Diptera, and Lepidoptera but members of some genera are parasitoids of adult and nymphal stages of hemimetabolus insects such as aphids and true bugs (Shaw & Huddleston 1991; Ghahari et al. 2006). Both external and internal parasitoids are common in the family, and the latter forms often display elaborate physiological adaptations for enhancement of larval survival within the host, including the use of endosymbiotic viruses for defeating host immune defense (Godfray 1994; Whitfield 2002). The fauna of Braconidae of Iran is quite well studied, with almost all previous papers compiled in the checklists by Modarres Awal (1997), Fallahzadeh & Saghaei (2010), and Gadallah & Ghahari (2013a, b, 2015). In this paper the species diversity of Braconidae from different regions of Iran is studied.

Material and methods

The specimens were collected by Malaise traps, rearing of different insect hosts and sweeping net from different regions of Iran. The specimens were put in ethanol 75%, pinned or mounted on small
labels and determined. Also several specimens from insect collections of different universities were checked. Classification, nomenclature and distributional data of Braconidae suggested by Yu et al. (2006) have been followed.

In total 28 braconid species belonging to 11 subfamilies are studied in this paper as the fauna of Iran. Three species Agathis semiaciculata Ivanov 1899, Chorebus (Chorebus) longicornis (Nees von Esenbeck 1811), and Chorebus (Phaenolexis) gedanensis (Ratzeburg 1852) are new records for the Iranian fauna. The list of species is given below together with the distributional data.

Results

Subfamily Agathidinae Haliday, 1833

Genus Agathis Latreille, 1805

Agathis lugubris (Foerster, 1862)

Material examined: Province of Kermanshah: Kermanshah, 34°20′N 47°00′E, (1♂), summer 2009.
Distribution outside Iran: Czech Republic, Finland, Germany, Hungary, Ireland, Netherlands, Norway, Poland, Slovakia, Switzerland, Turkey, UK, Ukraine.

Agathis semiaciculata Ivanov, 1899

Distribution outside Iran: Azerbaijan, Bulgaria, France, Georgia, Germany, Greece, Italy, Japan, Kazakhstan, Moldova, Mongolia, Poland, Russia, Switzerland, Turkmenistan, Ukraine.

Genus Bassus Fabricius, 1804

Bassus dimidiator (Nees von Esenbeck, 1834)

Distribution outside Iran: Armenia, Azerbaijan, Belarus, Bulgaria, Canada, China, Czech Republic, Finland, France, Germany, Greece, Hungary, Italy, Kazakhstan, Latvia, Lithuania, Moldova, Netherlands, Poland, Portugal, Russia, Slovakia, Switzerland, Turkey, UK, Ukraine, USA.

Subfamily Alysinae Leach, 1815

Genus Chorebus Haliday, 1833

Chorebus (Chorebus) longicornis (Nees von Esenbeck, 1811)

Distribution outside Iran: Austria, Belgium, Czech Republic, Faeroe Islands, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Netherlands, Poland, Portugal (Madeira Islands), Russia, Spain, Sweden, UK, Ukraine, former Yugoslavia.

Chorebus (Phaenolexis) compressiiventris (Telenga, 1935)

Distribution outside Iran: Azerbaijan, Caucasus, Ukraine.
Chorebus (Phaenolexis) gedanensis (Ratzeburg, 1852)

Distribution outside Iran: Bulgaria, Germany, Italy, Kazakhstan, Netherlands, Poland, Russia, Sweden, UK.

Genus Dinotrema Forster, 1862

Dinotrema (Dinotrema) cratocera (Thomson, 1895)

Material examined: Province of Kordestan: Baneh, 35°55′N 45°50′E, (2♀♀), September 2008.
Distribution outside Iran: Austria, Czech Republic, Hungary, Korea, Slovakia, Sweden.

Subfamily Brachistinae Foerster, 1862

Genus Eubazus Nees von Esenbeck, 1812

Eubazus (Brachistes) tibialis (Haliday, 1835)

Material examined: Province of Semnan: Damghan, 35°30′N 54°20′E, (2♂♂), spring 2000.
Distribution outside Iran: Belgium, Bulgaria, Croatia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Moldova, Netherlands, Norway, Poland, Russia, Serbia, Slovakia, Sweden, Switzerland, UK, Ukraine.

Genus Schizoprymnus Foerster, 1862

Schizoprymnus angustatus (Herrich-Schäffer, 1838)

Distribution outside Iran: Azerbaijan, Finland, Germany, Hungary, Italy, Kazakhstan, Lithuania, Moldova, Mongolia, Russia, Spain, Sweden, Switzerland, Ukraine.

Schizoprymnus nigripes (Thomson, 1892)

Material examined: Province of Kalaleh: 37°43′N 55°49′E, (3♀, 2♂), May 2005.
Distribution outside Iran: Czech Republic, Hungary, Kazakhstan, Korea, Moldova, Russia, Slovakia, Sweden.

Subfamily Braconinae Nees von Esenbeck, 1811

Genus Bracon Fabricius, 1804

Bracon (Bracon) trucidator Marshall, 1888

Material examined: Province of Hamadan: Malayer, 34°20′N 48°45′E, (1♂, 3♀♀), spring 2005.
Distribution outside Iran: Albania, Algeria, Armenia, Austria, Azerbaijan, Croatia, France, Georgia, Germany, Greece, Hungary, Italy, Kazakhstan, Moldova, Romania, Russia, Slovenia, Spain, Sweden, Switzerland, Tajikistan, Tunisia, Turkey, Ukraine.

Bracon (Glabrobracon) tschitscherini Kokujev, 1904

Distribution outside Iran: Azerbaijan, Cyprus, Greece, Hungary, Israel, Italy, Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Turkey, Turkmenistan, Uzbekistan.
Bracon (Lucobracon) guttiger Wesmael, 1838

Material examined: Province of Qazvin: Qazvin, 36°26′N 49°49′E, (3♀), October 2007. Distribution outside Iran: Austria, Belgium, Finland, France, Germany, Hungary, Italy, Latvia, Lithuania, Moldova, Mongolia, Netherlands, Poland, Russia, Slovenia, Sweden, Switzerland, UK.

Subfamily Cheloninae Foerster, 1862

Genus Chelonus Panzer, 1806

Chelonus (Chelonus) bidens Tobias, 1972

Material examined: Province of Kordestan: Marivan, 35°35′N 46°15′E, (1♀), October 2009. Distribution outside Iran: Czech Republic, Hungary, Kazakhstan, Russia, Turkey, Ukraine.

Chelonus (Chelonus) ocellatus Alexeev, 1971

Material examined: Province of Qazvin: Takestan, 36°00′N 49°33′E, (1♂), May 2010. Distribution outside Iran: Slovakia, Turkey, Turkmenistan, Ukraine.

Chelonus (Microchelonus) mucronatus Thomson, 1874

Material examined: Province of Kordestan: Sanandaj, 35°20′N 46°50′E, (1♂, 4♀♀), summer 2005. Distribution outside Iran: Hungary, Russia, Sweden, Turkey, Ukraine.

Subfamily Euphorinae Foerster, 1862

Genus Dinocampus Foerster, 1862

Dinocampus coccinellae (Schrank, 1802)

Material examined: Province of Isfahan: Isfahan, 32°16′N 52°26′E, (3♀♀), September 2007. Distribution outside Iran: Albania, Algeria, Argentina, Australia, Austria, Azerbaijan, Belgium, Brazil, Bulgaria, Canada, Chile, China, Cyprus, Czech Republic, Denmark (Greenland), Egypt, Fiji, Finland, France, Germany, Hungary, India, Ireland, Italy, Japan, Korea, Latvia, Lithuania, Moldova, Netherlands, New Zealand, Norway, Peru, Poland, Portugal (Madeira Islands), Russia, Serbia, Slovakia, Spain (Canary Islands), Switzerland, Syria, Turkey, UK, USA, Uruguay, Vietnam.

Genus Leiophron Nees von Esenbeck, 1819

Leiophron (Euphoriana) deficiens (Ruthe, 1856)

Material examined: Province of North Khorasan: Bojnord, 37°35′N 57°20′E, (2♀♀, 1♂), May 2007. Distribution outside Iran: Finland, Germany, Greece, Kazakhstan, Korea, Moldova, Poland, Russia, Sweden, Ukraine.

Genus Perilitus Nees von Esenbeck, 1819

Perilitus (Microctonus) aethiops Nees von Esenbeck, 1834

Material examined: Province of Kordestan: Kamyaran, 34°55′N 46°55′E, (3♂♂), September 2007. Distribution outside Iran: Armenia, Azerbaijan, Belarus, Belgium, Canada, Croatia, Czech Republic, France, Germany, Greece, Hungary, Ireland, Italy, Kazakhstan, Lithuania, Mongolia, Netherlands, Poland, Romania, Russia, Serbia, Sweden, Switzerland, UK, USA.
Subfamily Helconinae Forster, 1862

Genus Taphaeus Wesmael, 1835

*Taphaeus hiator* (Thunberg, 1824)


*Distribution outside Iran:* Belgium, Bulgaria, Czech Republic, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Kazakhstan, Lithuania, Moldova, Mongolia, Netherlands, Norway, Poland, Russia, Sweden, Switzerland, UK, USA.

Subfamily Macrocentrinae Foerster, 1862

Genus Macrocentrus Curtis, 1833

*Macrocentrus bicolor* Curtis, 1833


*Distribution outside Iran:* Albania, Andorra, Austria, Bulgaria, China, Czech Republic, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, Moldova, Netherlands, Norway, Poland, Romania, Russia, Serbia, Spain, Sweden, Switzerland, Turkey, UK, Ukraine.

Subfamily Microgastrinae Foerster, 1862

Genus Apanteles Foerster, 1862

*Apanteles (Apanteles) carpatus* (Say 1836)


*Distribution outside Iran:* Argentina, Armenia, Australia, Bermuda, Brazil, Canada, China, Congo, Croatia, Fiji, Finland, France, Germany, Ghana, Grenada, Hungary, Japan, Latvia, Lithuania, Malaysia, Moldova, Mongolia, Mozambique, New Zealand, Peru, Poland, Puerto Rico, Romania, Russia, South Africa, Spain, Switzerland, Tanzania, Turkey, Turkmenistan, UK, USA, Vietnam.

Genus Cotesia Cameron, 1891

*Cotesia risilis* (Nixon, 1974)


*Distribution outside Iran:* Czech Republic, Hungary, Italy, Netherlands, Romania, Slovakia, Turkey, UK, former Yugoslavia.

Genus Diolcogaster Ashmead, 1900

*Diolcogaster spreta* (Marshall, 1885)


*Distribution outside Iran:* China, Czech Republic, Hungary, Moldova, Turkey, UK.

Subfamily Opiinae Blanchard, 1845

Genus Biosteres Foerster, 1862

*Biosteres (Biosteres) longicauda* (Thomson, 1895)

Distribution outside Iran: Austria, China, Czech Republic, Denmark, Finland, France, Germany, Italy, Lithuania, Moldova, Russia, Slovenia, Sweden, Switzerland.

Genus *Opus* Wesmael, 1835

*Opus (Opiothorax) nigricoloratus* Fischer, 1958


Distribution outside Iran: Austria, Denmark, Finland, Germany, Greece, Hungary, Italy, Mongolia, Spain, Switzerland.

Subfamily Rogadinae Foerster, 1862

Genus *Aleiodes* Wesmael, 1838

*Aleiodes (Aleiodes) esenbeckii* (Hartig, 1838)

Material examined: Province of East Azarbaijan: Bonab, 37°20′N 46°03′E, (1♂, 4♀♀), May 2007.

Distribution outside Iran: Afghanistan, Austria, China, Czech Republic, Germany, Hungary, Japan, Korea, Lithuania, Mongolia, Norway, Russia, Spain, Taiwan, former Yugoslavia.

*Aleiodes (Heterogamus) testaceus* (Telenga, 1941)

Material examined: Province of Golestan: Gorgan, 36°50′N 54°30′E, (2♂♂, 1♀), April 2010.

Distribution outside Iran: Afghanistan, Algeria, Austria, Azerbaijan, Belgium, Bulgaria, China, Croatia, Czech Republic, Finland, France, Georgia, Germany, Greece, Hungary, India, Italy, Kazakhstan, Lithuania, Mongolia, Netherlands, Poland, Romania, Russia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkmenistan, Ukraine, UK, Uzbekistan.

Discussion

With attention to the results of this research and also the already published checklists on Iranian Braconidae (Modarres Awal 1997; Fallahzadeh & Saghaei 2010; Gadallah & Ghahari 2013a, b, 2015), the fauna of these parasitoids is diverse in Iran. However, Iran is a large country with various geographical regions and habitat. It forms a large part of the Iranian plateau, and covers an area of 1,623,779 km². Altitudinally, it ranges from 28 m below sea-level on the shores of the Caspian Sea to the 5,770 m of Mt. Damavand. Climatically, there is a contrast between the humid, almost jungle-like forests of the south Caspian and the arid, in places lifeless, deserts of the Dasht-e Lut. As a result of these major topographical, geological and climatic variation, Iran is rich in plant diversity. The country supports a total of around 8,000 plant species, and is one of the major centres of endemism in this part of the world (Zehzad et al. 2002). Therefore, more investigations and complementary sampling are needed in order to investigate the complete identification, geographical distribution and trophic associations of braconid wasps in different parts of Iran. The braconid wasps have an effective role in the biological control of different agricultural and forest pests especially Lepidoptera and Diptera. One of the most effective procedures for conservation of natural enemies is decreasing application of the destructive chemical pesticides (De Bach & Rosen 1991; Bellows & Fisher 1999).

Acknowledgements

The author is grateful to M. Fischer (Austria), J. Papp (Hungary), late V. Tobias (Russia) and C. van Achterberg (Netherlands) for their cooperation on identification of specimens and sending the
necessary papers. Also to H. Sakenin, H. Ghahari and J. Rastegar for loaning some specimens, and to the editors for their for valuable comments. This research was supported by Islamic Azad University (Yadegar - e- Imam Khomeini (RAH) Branch).

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