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A faunistic study of Braconidae (Hymenoptera: Ichneumonoidea) from southern Iran

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A b s t r a c t : This paper deals with the faunistic data on the braconid wasps (Hymenoptera: Braconidae) collected from four provinces of southern Iran: Chaharmahal & Bakhtiari, Fars, Khuzestan, and Kuhgiloyeh & Boyerahmad. In total 27 species from the subfamilies Agathidinae (4 species, 2 genera), Alysinae (4 species, 1 genus), Brachistinae (4 species, 3 genera), Braconinae (4 species, 1 genus), Cheloninae (5 species, 3 genera), Gnamptodontinae (1 species, 1 genus), Hormiinae (1 species, 1 genus), Microgastrinae (2 species, 1 genus), Microtypinae (1 species, 1 genus), and Rogadinae (1 species, 1 genus) were collected and identified.

K e y w o r d s : Hymenoptera, Ichneumonoidea, Braconidae, fauna, Iran.

Introduction

The family Braconidae is the second largest family of the order Hymenoptera containing more than 20,000 valid species worldwide (YU et al. 2012). Braconidae contain efficient parasitoids of larval stages of many holometabolous taxa belonging to Coleoptera, Diptera and Lepidoptera, as well to some hemimetabolus groups (aphids, Heteroptera, Embiidina) (SHAW & HUDDLESTON 1991; SHAW 2006). Braconid parasitoids are able to control pest populations and may be part of more eco-friendly agricultural methods. Alternative and safer control methods have been investigated, especially during the last century, due to the hazardous nature of chemicals used in the control of pest species (DE BACH & ROSEN 1991; SHAMIM 2013). One of the best alternative methods of pest control proved to be the use of parasitoids (VAN DEN BOSCH et al. 1982; GODFRAY 1994; VAN DRIESCHE & BELLOWS 1996). Biological control can reduce the production costs and the environmental impact of agriculture by pesticide residues and resistance. Furthermore, when inundative releases or biopesticides ("input substitution") are used, it replaces cheap and ecologically harmful measurements by expensive and benign ones, thus increasing costs and failing to address the economic crisis faced by the world's farmers (ALTIERI 1994; ALTIERI et al. 1997). Faunistic surveys on Braconidae should be continued in different areas of Iran, because knowing the local fauna of natural enemies is the first step in biological control programs.

It is obvious from the published catalogues on Agathidinae (28 species by GADALLAH & GHAHARI 2013a), Brachistinae (17 species by GADALLAH & GHAHARI 2013a), Cheloninae (48 species by GADALLAH & GHAHARI 2013b), Alysiinae (55 species by KHAJEH et al.

2014; 78 species by GADALLAH et al. 2015) and Braconinae (115 species and subspecies by GADALLAH & GHAHARI 2015) that the Iranian braconid fauna is diverse. The braconid fauna of the southern parts of Iran is poorly studied compared to the northern and north-western parts and the aim of this paper is to improve our knowledge of this fauna.

Material and Methods

The researched specimens were collected by Malaise traps, sweeping net and rearing their hosts in the southern Iranian provinces of Chaharmahal & Bakhtiari, Fars, Khuzestan, and Kuhgiloyeh & Boyerahmad.

Chaharmahal & Bakhtiari province (32°19′N 50°51′E) has an area of 16,332 km^2. It is located at the centre of Zagros Mountains. This region forms one percent of the whole country and includes the Zagros River. About 10% of the fresh water sources of Iran are in this province. Because of the high mountains and the humid Mediterranean winds there is sufficient rain, which frequently falls as snow at the top of the mountains.

Fars province (29°37′N 52°32′E) has an area of 122,400 km². There are three distinct climatic regions in the province. The north and northwest mountainous areas have moderate cold winters and mild summers. The central regions have relatively rainy mild winters and hot dry summers. Finally, the south and southeast regions have cold winters and hot summers. The geographical and climatic variation within the province results in diverse vegetation, and consequently, faunas.

Khuzestan province (31°32'N 48°69'E) covers an area of 63,238m km^2. The province can be basically divided into two regions, the rolling hills and mountainous regions north of the Ahvaz Ridge, and the plains and marshlands to its south. The climate of Khuzestan is generally hot and occasionally humid, particularly in the south, while the winters are colder and dry. Summertime temperature routinely exceeds 40 degrees Celsius and during the winter it can drop below zero, with occasional snowfall.

Kuhgiloyeh & Boyerahmad (30°67'N 51°60'E) province covers an area of 15,563 km^2. The province is mostly mountainous in terrain and part of the Zagros range. The highest point is the Dena summit with a height of 4,409 meters. The mountain range of Dena, with more than 20 peaks over 4000 meters high, is similar to the Himalayas in miniature and covered with oak forests.

Results

In total, 27 braconid species belonging to 10 subfamilies were identified. The family Braconidae contains parasitoids of various pest species, especially those belonging to the Lepidoptera. The list of braconid species from southern regions of Iran with distribution data is given below alphabetically. YU et al. (2012) is followed for the classification, nomenclature and published distribution data of the reported Braconidae.

Subfamily A g a t h i d i n a e HALIDAY, 1833

Genus *Agathis* LATREILLE, 1805

***Agathis fulmeki* FISCHER, 1957**

M a t e r i a l e x a m i n e d : Kuhgiloyeh & Boyerahmad province, Yasuj, 30°40′N 51°35′E, 2♀♀, August 2011.

D i s t r i b u t i o n o u t s i d e I r a n : Austria, Bulgaria, France, Greece, Hungary, Morocco, Spain, Turkey.

Agathis *malvacearum* LATREILLE, 1805

M a t e r i a l e x a m i n e d : Khuzestan province, Behbahan, 30°36′N 50°15′E, 1♀, 1♂, April 2009. Chaharmahal & Bakhtiari province, Shahrekord, 32°19′N 50°48′E, 1♀, September 2009.

D i s t r i b u t i o n o u t s i d e I r a n : Albania, Armenia, Azerbaijan, Bulgaria, Canada, Croatia, Czech Republic, Finland, France, Georgia, Germany, Greece, Hungary, Italy, Kazakhstan, Latvia, Lithuania, Macedonia, Moldova, Mongolia, Netherlands, Poland, Romania, Russia, Slovakia, Slovenia, Spain, Switzerland, Tajikistan, Turkey, USA, Ukraine, UK, Uzbekistan.

***Agathis syngenesiae* NEES VON ESENBECK, 1812**

M a t e r i a l e x a m i n e d : Fars province, Abadeh, 31°09′N 52°39′E, 2♀♀, May 2010.

D i s t r i b u t i o n o u t s i d e I r a n : Azerbaijan, Bulgaria, France, Georgia, Germany, Greece, Italy, Japan, Japan, Kazakhstan, Moldova, Mongolia, Poland, Russia, Switzerland, Turkmenistan, Ukraine.

Genus *Bassus* FABRICIUS, 1804

***Bassus tumidulus* (NEES VON ESENBECK, 1812)**

M a t e r i a l e x a m i n e d : Kuhgiloyeh & Boyerahmad province, Dehdasht, 30°47′N 50°33′E, 2♀♀, August 2011.

D i s t r i b u t i o n o u t s i d e I r a n : Austria, Azerbaijan, Belarus, Belgium, Bulgaria, China, Croatia, Czech Republic, Finland, France, Georgia, Germany, Greece, Hungary, Ireland, Italy Japan, Kazakhstan, Korea, Latvia, Lithuania, Moldova, Mongolia, Morocco, Netherlands, Norway, Poland, Portugal, Russia, Slovakia, Spain, Sweden, Switzerland, Turkey, Ukraine, UK.

Subfamily A l y s i n a e LEACH, 1815

Genus *Chorebus* HALIDAY, 1833

***Chorebus* (*Chorebus*) *gracilipes* (THOMSON, 1895)**

M a t e r i a l e x a m i n e d : Fars province, Kazerun, 29°37′N 51°39′E, 1♀, May 2010.

D i s t r i b u t i o n o u t s i d e I r a n : Poland, Russia, Sweden, former Yugoslavia.

***Chorebus* (*Chorebus*) *nixoni* BURGHELE, 1959**

Material examined: Khuzestan province, Behbahan, 30°36′N 50°15′E, 1♀, April 2009.

Distribution outside Iran: Azerbaijan, Romania, Russia, Spain.

***Chorebus* (*Chorebus*) *uliginosus* (HALIDAY, 1839)**

Material examined: Kuhgiloyeh & Boyerahmad province, Dogonbadan, 30°21′N 50°47′E, 1♂, August 2011.

Distribution outside Iran: Belgium, Germany, Ireland, Lithuania, Netherlands, Poland, Romania, Sweden, Ukraine, UK.

***Chorebus* (*Stiphrocera*) *flavipes* (GOUREAU, 1851)**

Material examined: Chaharmahal & Bakhtiari province, Lordegan, 31°30′37″N 50°49′46″E, 2♀♀, September 2009.

Distribution outside Iran: Denmark, France, Germany, Ireland, Kazakhstan, Poland, Russia, Spain, UK, former Yugoslavia.

Subfamily Brachistinae FOERSTER, 1863

Genus *Foersteria* SZÉPLIGETI, 1896

***Foersteria longicauda* van ACHTERBERG, 1990**

Material examined: Kuhgiloyeh & Boyerahmad province, Yasuj, 30°40′N 51°35′E, 1♀, August 2011.

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

Genus *Schizoprymnus* FOERSTER, 1863

***Schizoprymnus parvus* (THOMSON, 1892)**

Material examined: Chaharmahal & Bakhtiari province, Borojen, 31°54′N 51°12′E, 2♀♀, September 2009.

Distribution outside Iran: Finland, Germany, Greece, Hungary, Kazakhstan, Mongolia, Netherlands, Sweden.

***Schizoprymnus terebralis* (ŠNOFLÁK, 1953)**

Material examined: Fars province, Eghlid, 30°53′N 52°41′E, 1♀, May 2010.

Distribution outside Iran: Armenia, Azerbaijan, Bulgaria, Czech Republic, Czech Republic, Greece, Hungary, Kazakhstan, Moldova, Russia, Slovakia, Ukraine.

Genus *Triaspis* HALIDAY, 1835

***Triaspis lugubris* ŠNOFLÁK, 1953**

Material examined: Kuhgiloyeh & Boyerahmad province, Dehdasht, 30°47′N 50°33′E, 1♀, August 2011.

General distribution: Hungary, Kazakhstan, Korea, Russia.

Subfamily Braconinae NEES VON ESENBECK, 1811

Genus *Bracon* FABRICIUS, 1804

***Bracon* (*Glabrobracon*) *lividus* TELENGA, 1936**

Material examined: Khuzestan province, Izeh, 31°54′N 49°59′E, 2♀♀, April 2009.

Distribution outside Iran: Cyprus, Israel, Kazakhstan, Switzerland, Turkey.

***Bracon* (*Glabrobracon*) *osculator* NEES VON ESENBECK, 1811**

Material examined: Fars province, Abadeh, 31°09′N 52°39′E, 1♀, 1♂, May 2010.

Distribution outside Iran: Afghanistan, Austria, Azerbaijan, Belgium, Bosnia-Hercegovina, Croatia, Cyprus, Czech Republic, Denmark, Finland, France, Georgia, Germany, Greece, Hungary, Iraq, Ireland, Israel, Italy, Kazakhstan, Korea, Latvia, Lithuania, Macedonia, Moldova, Mongolia, Netherlands, Norway, Poland, Romania, Russia, Serbia, Slovenia, Spain, Sweden, Switzerland, Turkey, Turkmenistan, Ukraine, UK.

***Bracon* (*Orthobracon*) *epitriptus* MARSHALL, 1885**

Material examined: Kuhgiloyeh & Boyerahmad province, Yasuj, 30°40′N 51°35′E, 2♀♀, August 2011. Chaharmahal & Bakhtiari province, Farsan, 32°15′N 50°34′E, 1♀, September 2009.

Distribution outside Iran: Armenia, Austria, Azerbaijan, Belarus, China, Georgia, Germany, Greece, Hungary, Italy, Kazakhstan, Korea, Lithuania, Moldova, Mongolia, Netherlands, Poland, Romania, Russia, Slovenia, Switzerland, Turkey, Ukraine, UK

***Bracon* (*Pigeria*) *piger* WESMAEL, 1838**

Material examined: Chaharmahal & Bakhtiari province, Shahrekord, 32°19′N 50°48′E, 1♀, September 2009. Fars province, Fasa, 28°56′N 53°38′E, 1♀, 1♂, May 2010.

Distribution outside Iran: Afghanistan, Albania, Algeria, Azerbaijan, Belgium, Canary Islands, China, Croatia, Cyprus, Egypt, Finland, France, Georgia, Germany, Greece, Hungary, India, Israel, Italy, Kazakhstan, Macedonia, Moldova, Mongolia, Montenegro, Netherlands, Portugal, Romania, Russia, Saudi Arabia, Serbia, Spain, Sweden, Switzerland, Syria, Tajikistan, Tunisia, Turkey, Turkmenistan, Ukraine, UK, Uzbekistan.

Subfamily C h e l o n i n a e FOERSTER, 1863

Genus *Ascogaster* WESMAEL, 1835

***Ascogaster quadridentata* WESMAEL, 1835**

M a t e r i a l e x a m i n e d : Khuzestan province, Ahvaz, 31°19′N 48°41′E, 2♂♂, April 2009.

D i s t r i b u t i o n o u t s i d e I r a n : Armenia, Austria, Belgium, Bulgaria, Canada, China, Croatia, Cyprus, Czech Republic, Finland, France, Germany, Greece, Hungary, Italy, Japan, Kazakhstan, Korea, Latvia, Lithuania, Macedonia, Moldova, Mongolia, Morocco, Netherlands, New Zealand, Peru, Poland, Romania, Russia, Serbia, Slovakia, Spain, Sweden, Switzerland, Turkey, Turkmenistan, USA, Ukraine, UK.

Genus *Chelonus* PANZER, 1806

***Chelonus* (*Chelonus*) *microsomus* TOBIAS,1964**

M a t e r i a l e x a m i n e d : Kuhgiloyeh & Boyerahmad province, Dogonbadan, 30°21′N 50°47′E, 1♂, August 2011.

Distribution outside Iran: Kazakhstan, Turkey.

***Chelonus* (*Chelonus*) *szepligetii* DALLA TORRE, 1898**

M a t e r i a l e x a m i n e d : Chaharmahal & Bakhtiari province, Lordegan, 31°30′N 50°49′E, 2♀♀, 2♂♂, September 2009.

D i s t r i b u t i o n o u t s i d e I r a n : Azerbaijan, Croatia, Hungary, Turkey.

***Chelonus* (*Parachelonus*) *pellucens* (NEES VON ESENBECK, 1816)**

M a t e r i a l e x a m i n e d : Fars province, Fasa, 28°56′N 53°38′E, 1♀, 1♂, May 2010.

D i s t r i b u t i o n o u t s i d e I r a n : Armenia, Azerbaijan, Bosnia-Hercegovina, Bulgaria, Croatia, Czech Republic, France, Germany, Hungary, Italy, Kazakhstan, Kyrgyzstan, Lithuania, Macedonia, Moldova, Mongolia, Poland, Romania, Russia, Serbia, Spain, Switzerland, Turkey, Ukraine, UK, Uzbekistan.

Subfamily D o r y c t i n a e FOERSTER, 1863

Genus *Gildoria* HEDQVIST, 1974

***Gildoria titubata* (PAPP, 1985)**

M a t e r i a l e x a m i n e d : Kuhgiloyeh & Boyerahmad province, Dehdasht, 30°47′N 50°33′E, 1♀, 1♂, August 2011.

D i s t r i b u t i o n o u t s i d e I r a n : France, Greece, Israel, Italy, Spain.

Subfamily G n a m p t o d o n t i n a e FISCHER, 1970

Genus *Gnamptodon* HALIDAY, 1833

***Gnamptodon georginae* (van ACHTERBERG, 1983)**

Material examined: Khuzestan province, Behbahan, 30°36′N 50°15′E, 1♀, 1♂, April 2009.

Distribution outside Iran: Algeria, Bulgaria, China, Germany, Italy, Moldova, Poland, Russia, Switzerland, Ukraine.

Subfamily Hormiinae FOERSTER, 1863

Genus *Pseudobiosteres* HEDWIG, 1961

***Pseudobiosteres imperfectus* HEDWIG, 1961**

Material examined: Fars province, Kazerun, 29°37′N 51°39′E, 1♂, May 2010.

Distribution outside Iran: Afghanistan.

Subfamily Microgastrinae FOERSTER, 1863

Genus *Apanteles* FOERSTER, 1862

***Apanteles* (*Apanteles*) *circumscriptus* (NEES VON ESENBECK, 1834)**

Material examined: Fars province, Abadeh, 31°09′N 52°39′E, 1♀, May 2010. Kuhgiloyeh & Boyerahmad province, Yasuj, 30°40′N 51°35′E, 1♀, August 2011.

Distribution outside Iran: Afghanistan, Armenia, Azerbaijan, Belgium, Bulgaria, China, Croatia, Czech Republic, Finland, France, Georgia, Germany, Greece, Hungary, Iran, Ireland, Israel, Italy, Jordan, Kazakhstan, Libya, Lithuania, Moldova, Mongolia, Netherlands, Norway, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Switzerland, Tajikistan, Tunisia, Turkey, Turkmenistan, Ukraine, UK, Uzbekistan.

***Apanteles* (*Apanteles*) *scutellaris* MUESEBECK, 1921**

Material examined: Khuzestan province, Izeh, 31°54′N 49°59′E, 1♂, April 2009.

Distribution outside Iran: Bulgaria, Cyprus, Hungary, Mexico, USA.

Subfamily Microtypinae SZÉPLIGETI, 1908

Genus *Microtypus* RATZEBURG, 1848

***Microtypus wesmaelii* RATZEBURG, 1848**

Material examined: Kuhgiloyeh & Boyerahmad province, Dogonbadan, 30°21′N 50°47′E, 3♀♀, August 2011.

Distribution outside Iran: Bulgaria, Canada, China, Czech Republic, Germany, Hungary, Italy, Netherlands, Russia, Slovakia, Turkey, USA, UK.

Subfamily R o g a d i n a e FOERSTER, 1863

Genus *Aleiodes* WESMAEL, 1838

***Aleiodes* (*Aleiodes*) *pallidator* (THUNBERG, 1822)**

M a t e r i a l e x a m i n e d : Khuzestan province, Ahvaz, 31°19′N 48°41′E, 1♀, 1♂, April 2009.

D i s t r i b u t i o n o u t s i d e I r a n : Afghanistan, Armenia, Austria, Azerbaijan, Belgium, Chile, China, Croatia, Czech Republic, Finland, France, Georgia, Germany, Greece, Hungary, Israel, Italy, Kazakhstan, Korea, Kyrgyzstan, Latvia, Lithuania, Moldova, Mongolia, Netherlands, Norway, Poland, Russia, Serbia, Slovakia, Sweden, Switzerland, Tajikistan, Tunisia, Turkey, Turkmenistan, USA, Ukraine, UK, Uzbekistan.

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Zusammenfassung

Vorliegende Arbeit behandelt die Brackwespenfauna (Hymenoptera: Braconidae) der vier Provinzen Chaharmahal-Bakhtiari, Fars, Khuzestan sowie Kuhgiloyeh-Boyerahmad im Süden des Irans. In Summe gelang der Nachweis von 27 Arten der Unterfamilien Agathidinae (4 Arten, 2 Gattungen), Alysinae (4 Arten, 1 Gattung), Brachistinae (4 Arten, 3 Gattungen), Braconinae (4 Arten, 1 Gattung), Cheloninae (5 Arten, 3 Gattungen), Gnamptodontinae (1 Art, 1 Gattung), Hormiinae (1 Art, 1 Gattung), Microgastrinae (2 Arten, 1 Gattung), Microtypinae (1 Art, 1 Gattung), and Rogadinae (1 Art, 1 Gattung).

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