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Some New records of Braconidae (Hymenoptera) for Iran

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A b s t r a c t : Braconidae (Hymenoptera) is one of the largest groups of parasitic insects which have efficient role in biological control. In this research, totally 25 species from 18 genera and 13 subfamilies (including, Agathidinae, Alysiinae, Brachistinae, Braconinae, Cheloninae, Euphorinae, Gnampodontinae, Helconinae, Macrocentrinae, Microgastrinae, Opiinae, Rogadinae, Sigalphinae) were collected from different regions of Iran as new records.

K e y w o r d s : Braconidae, Fauna, New record, Iran.

Introduction

Braconidae is the second largest family of Hymenoptera, with >40,000 species (SHARKEY 1993). The family is cosmopolitan and diverse in all areas, with no strong preference for tropical or temperate regions or for wet or dry habitats. It ranks first in effectiveness of reducing or holding in balance numerous phytophagous pests (SHARKEY & WAHL 1992, SHARKEY 1993, GHAHARI et al. 2006). Most braconids are primary endoparasitoids of Lepidoptera larvae, although most holometabolous groups may be attacked, e.g. Diptera, Coleoptera and other Hymenoptera. Some species attack spiders, and some are hyperparasitic. There are both solitary and gregarious species in the family, and some are ectoparasitic. Braconids have been used extensively in biological control with much success (MATTHEWS 1974, SHAW & HUDDLESTON 1991, WHARTON 1993).

The family appears to date from early Cretaceous (assuming *Eobracon* is properly assigned to family - RASNITSYN 1983, WHITFIELD 2002), diversifying extensively in the mid to late Cretaceous and early Tertiary, when flowering plants and their associated holometabolous herbivores, the main hosts for braconid parasitoids, radiated (BASIBUYUK et al., 1999, QUICKE et al. 1999, BELSHAW et al. 2000). The species richness of the family is matched by a morphological diversity virtually unrivalled among the Hymenoptera.

Braconidae is one of the major groups of insect parasitoids that included a large number of species that are effective enough to exert a definite regulatory impact on the increase of numerous important plant pests. Hyperparasitism is less developed than in the Ichneumonidae and is of rare occurrence. Braconids are thus almost wholly beneficial. Principal exceptions are species of *Perilitus* that parasitize adults of entomophagous Coccinellidae (CLAUSEN 1940, MATTHEWS 1974, WHARTON 1993).

The fauna of Iranian Braconidae was poorly studied (MODARRES AWAL 1997) and the main researches are restricted to the recent works (GHAHARI et al. 2009a, b, c, d). The aim of this research which is a part of larger project "Iranian Braconidae", is determining of Iranian braconids' fauna as the powerful parasitoids in biological pests control.

Materials and Methods

Specimens were collected by sweeping net and malaise traps from different regions of Iran. The samplings were conducted between 2000 and 2007, and the collected specimens were killed with ethyl acetate and mounted on triangular labels and were examined with a stereoscopic binocular microscope. In addition to the mentioned collecting methods, some specimens preserved in the collections of many Iranian universities and also the materials of some world museums were used in this paper. Classification, nomenclature and distributional data of Braconidae suggested by YU et al. (2006) have been followed.

Results

In a total 25 species from 18 genera and 13 subfamilies were collected from different regions of Iran. The list of species which all of them are newly recorded from Iran is given below.

Subfamily *Agathidinae* HALIDAY 1833

Genus *Agathis* LATREILLE 1805

Agathis syngenesiae NEES VON ESENBECK 1812

Material: Hamadan province: Nahavand, 1 ♀, April 2002. Ilam province: Ilam, 2 ♂♂, October 2005.

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

Subfamily *Alysinae* LEACH 1815

Genus *Alloea* HALIDAY 1833

Alloea contracta (HALIDAY 1833)

Material: Mazandaran province: Ghaemshahr, Savadkooh, 2 ♀♀, 1 ♂, October 2007.

Distribution outside Iran: Palaearctic (Belgium, Faeroe Islands, Germany, Hungary, Iceland, Ireland, Mongolia, Netherlands, Poland, Spain, Sweden, United Kingdom).

Genus *Chorebus* HALIDAY 1833

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

M a t e r i a l : Kordestan province: Sanandaj, 2 ♀ ♀, August 2001.

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

***Chorebus (Chorebus) mucronatus* (TELENGA 1935)**

M a t e r i a l : Mazandaran province: Ramsar, 3 ♀ ♀, July 2001.

D i s t r i b u t i o n o u t s i d e I r a n : Palaearctic (Hungary, Russia, Sweden, Turkey, Ukraine).

***Chorebus (Stiphrocera) misellus* (MARSHALL 1895)**

M a t e r i a l : Semnan province: Shahrood, 2 ♀ ♀, September 2000.

D i s t r i b u t i o n o u t s i d e I r a n : Palaearctic (Afghanistan, Austria, Azerbaijan, Belgium, Denmark, France, Germany, Greece, Hungary, Italy, Kazakhstan, Poland, Russia, Spain, Sweden, United Kingdom, former Yugoslavia).

Genus *Dinotrema* FORSTER 1862

***Dinotrema (Dinotrema) significarium* (FISCHER 1973)**

M a t e r i a l : Sistan-Baluchestan province: Zabol, 2 ♂ ♂, December 2004.

D i s t r i b u t i o n o u t s i d e I r a n : Palaearctic (Austria, Greece, Hungary, Korea).

Genus *Protodacnusa* GRIFFITHS 1964

***Protodacnusa aridula* (THOMSON 1895)**

M a t e r i a l : Fars province: Shiraz, 1 ♀, September 2006.

D i s t r i b u t i o n o u t s i d e I r a n : Palaearctic (Germany, Sweden).

Subfamily *B r a c h i s t i n a e* FOERSTER 1862

Genus *Schizoprymnus* FOERSTER 1862

***Schizoprymnus excisus* (ŠNOFLÁK 1953)**

M a t e r i a l : Kerman province: Kerman, 2 ♂ ♂, April 2004.

D i s t r i b u t i o n o u t s i d e I r a n : Palaearctic (Armenia, Czech Republic, Hungary, Kazakhstan, Russia, Serbia, Ukraine, former Yugoslavia).

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

M a t e r i a l : Isfahan province: Shahreza, Najaf-Abad, Isfahan, 2 ♀ ♀, 2 ♂ ♂, July 2004.

D i s t r i b u t i o n o u t s i d e I r a n : Palaearctic (Armenia, Azerbaijan, Bulgaria,

Czech Republic, former Czechoslovakia, Greece, Hungary, Kazakhstan, Moldova, Russia, Ukraine).

Subfamily B r a c o n i n a e NEES VON ESENBECK 1811

Genus *Bracon* FABRICIUS 1804

***Bracon (Bracon) trucidator* MARSHALL 1888**

M a t e r i a l : Kermanshah province: Kermanshah, 1 ♀, April 2001.

D i s t r i b u t i o n o u t s i d e I r a n : Palaearctic (Albania, Algeria, Armenia, Austria, Azerbaijan, Croatia, France, Georgia, Germany, Greece, Hungary, Italy, Kazakhstan, Moldova, Romania, Russia, Slovenia, Spain, Sweden, Switzerland, Tajikistan, Tunisia, Turkey, Ukraine, former Yugoslavia).

***Bracon (Glabrobracon) planinotus* TOBIAS 1957**

M a t e r i a l : Kermanshah province: Kermanshah, 1 ♀, 1 ♂, April 2001.

D i s t r i b u t i o n o u t s i d e I r a n : Palaearctic (Kazakhstan, Russia, Turkey, Ukraine).

***Bracon (Lucobracon) guttiger* WESMAEL 1838**

M a t e r i a l : Zanjan province: Zanjan, 1 ♀, August 2004. Hamadan province: Hamadan, 1 ♀, July 2005.

D i s t r i b u t i o n o u t s i d e I r a n : Palaearctic (Austria, Belgium, Finland, France, Germany, Hungary, Italy, Latvia, Lithuania, Moldova, Mongolia, Netherlands, Poland, Russia, Slovenia, Sweden, Switzerland, United Kingdom).

Subfamily C h e l o n i n a e FOERSTER 1862

Genus *Ascogaster* WESMAEL 1835

***Ascogaster quadridentata* WESMAEL 1835**

M a t e r i a l : Kordestan province: Sanandaj, 2 ♂♂, July 2000.

D i s t r i b u t i o n o u t s i d e I r a n : Nearctic, Neotropical, Oceanic, Oriental, Palaearctic (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, U.S.A., Ukraine, United Kingdom, former Yugoslavia).

Genus *Chelonus* PANZER 1806

***Chelonus (Microchelonus) mucronatus* THOMSON 1874**

M a t e r i a l : Ilam province: Ilam (Wheat field), 1 ♀, August 2001.

D i s t r i b u t i o n o u t s i d e I r a n : Palaearctic (Hungary, Russia, Sweden, Turkey, Ukraine).

Subfamily Euphorinae FOERSTER 1862

Genus *Perilitus* NEES VON ESENBECK 1819

***Perilitus (Microctonus) aethiops* NEES VON ESENBECK 1834**

Material: Kermanshah province: Kermanshah (Wheat field), 2♂♂, October 2003.

Distribution outside Iran: Nearctic, Palaearctic (Armenia, Azerbaijan, Belarus, Belgium, Canada, Croatia, Czech Republic, France, Germany, Greece, Hungary, Ireland, Italy, Kazakhstan, Lithuania, Mongolia, Netherlands, Poland, Romania, Russia, Serbia, Sweden, Switzerland, U.S.A., United Kingdom, former Yugoslavia).

***Perilitus (Microctonus) stelleri* LOAN 1972**

Material: Isfahan province: Najaf-Abad (Corn field), 1♂, August 2001.

Distribution outside Iran: Palaearctic (France, Germany, Hungary, Russia, Switzerland).

Subfamily Gnampodontinae FISCHER 1970

Genus *Gnamptodon* HALIDAY 1833

***Gnamptodon georginae* (ACHTERBERG 1983)**

Material: Golestan province: Bandar-Torkman (Cotton field), 1♀, September 2003.

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

Subfamily Helconinae FOERSTER 1862

Genus *Diospilus* HALIDAY 1833

***Diospilus nigricornis* (WESMAEL 1835)**

Material: Khuzestan province: Ahwaz, 2♂♂, December 2002.

Distribution outside Iran: Palaearctic (Austria, Azerbaijan, Belarus, Belgium, Bulgaria, Czech Republic, Finland, France, Georgia, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Moldova, Netherlands, Norway, Poland, Russia, Slovenia, Sweden, Switzerland, Ukraine, United Kingdom, former Yugoslavia).

Genus *Taphaeus* WESMAEL 1835

***Taphaeus hiator* (THUNBERG 1824)**

Material: Chahrmahal-Bakhtiari province: Shahrekord, 3♀♀, June 2005.

Distribution outside Iran: Nearctic, Palaearctic (Belgium, Bulgaria, Czech Republic, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Kazakhstan, Lithuania, Moldova, Mongolia, Netherlands, Norway, Poland, Russia, Sweden, Switzerland, U.S.A., United Kingdom).

Subfamily *Macrocentrinae* FOERSTER 1862

Genus *Macrocentrus* CURTIS 1833

***Macrocentrus bicolor* CURTIS 1833**

Material: Fars province: Shiraz, 1♀, October 2001.

Distribution outside Iran: Oriental, Palearctic (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, Ukraine, United Kingdom, former Yugoslavia).

Subfamily *Microgastrinae* FOERSTER 1862

Genus *Apanteles* FOERSTER 1862

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

Material: Isfahan province: Shahinshahr, Isfahan, 3♀♀, August 2006; larval parasitoid of *Lithocolletis blancardella* FABR. (Lepidoptera: Gracillariidae).

Distribution outside Iran: Oceanic, Palearctic (Armenia, Austria, Azerbaijan, Belgium, Bulgaria, Czech Republic, Finland, Georgia, Germany, Hungary, Ireland, Israel, Italy, Korea, Latvia, Lithuania, Madeira Islands, Moldova, Netherlands, New Zealand, Poland, Russia, Slovakia, Spain, Switzerland, Ukraine, United Kingdom, former Yugoslavia).

Subfamily *Opiinae* BLANCHARD 1845

Genus *Opius* WESMAEL 1835

***Opius (Opiothorax) nigricoloratus* FISCHER 1958**

Material: Semnan province: Shahrood, 1♀, 1♂, November 2003.

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

***Opius (Opius) paraplasicus* FISCHER 1972**

Material: Semnan province: Damghan, 1♀, 1♂, November 2003.

Distribution outside Iran: Central Palearctic, Afrotropical (South Africa).

Subfamily *Rogadinae* FOERSTER 1862

Genus *Aleiodes* WESMAEL 1838

***Aleiodes (Aleiodes) pallidator* (THUNBERG 1824)**

Material: Kerman province: Kerman, 1♂, June 2005.

Distribution outside Iran: Nearctic, Neotropical, Oriental, Palearctic

(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, U.S.A., Ukraine, United Kingdom, Uzbekistan, former Yugoslavia).

Subfamily Sigalphinae HALIDAY 1833

Genus *Sigalphus* LATREILLE 1802

***Sigalphus irrorator* (FABRICIUS 1775)**

M a t e r i a l : Golestan province: National park, 1 ♀, April 2006.

D i s t r i b u t i o n o u t s i d e I r a n : Palearctic (Austria, Belgium, Czech Republic, Finland, France, Germany, Hungary, Italy, Japan, Korea, Latvia, Netherlands, Poland, Romania, Russia, Slovakia, Spain, Sweden, Switzerland, Ukraine, United Kingdom).

Discussion

The result of this survey indicates that there are diverse and on the other hand unknown fauna of Braconidae in different regions of Iran which can have efficient and powerful role in biological control programs, if they are conserved in agroecosystems. Parasitoid insects have several biological, ecological, and evolutionary features that make them an ideal model for addressing questions in population biology, from behavioural ecology to population dynamics. The study of their reproductive strategies, which show important interspecific variation, raises several problems that can only be solved through the use of tools and methods from several diverse fields like molecular biology, biochemistry, and physiology, but also organism biology, population genetics, and even theoretical or community ecology. Moreover, the particular mode of development of parasitoid insects enables us to use them in pest control strategies to protect crops. In recent decades this application has seen progressive uptake all over the world as the economics become favourable, leading to increasing avoidance of chemical pesticides that are noxious to both the environment and human health. The design of efficient biological control programs against phytophagous pests on a given crop system implies the identification of potential biological control agents for production and release, along with an accurate understanding of their biology. This needs both pragmatic, empirical studies and a more formal approach based on evolutionary biology and ecology. Such combined fundamental and applied scientific work explains why a significant number of research laboratories worldwide are currently working on insect parasitoids (MACKAUER et al. 1990, THOMAS et al. 2007, WAJNBERG et al. 2008).

Since Iran is a large country incorporating a various geographical regions and climates, therefore it would be expected that a large number of additional species remain to be discovered. Several surveys should be conducted on this important insect group in Iran, because existing of other new records and even new species is expected. Also a checklist on Iranian Braconidae was published (FALAHZADEH & SAGHAEI 2009), but it is an in-

complete work with several deficiencies and mistakes because many common papers and data on the subject were not used. On the other hand the three mentioned papers (GHAHARI et al. 2009a, b, c, d) which were published before publishing the checklist, were not used by its authors. Surely, preparing a check-list is an important and helpful systematic work, and therefore it must be prepared by the authorized specialists or with their direct help.

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Zusammenfassung

Die Braconidae (Hymenoptera) bilden eine der größten Gruppen der parasitischen Insekten, die eine wirkungsvolle Rolle bei der biologischen Bekämpfung spielen. Die gegenwärtige Studie listet 25 Arten aus 18 Gattungen und 13 Unterfamilien der Braconidae (Agathidinae, Alysiinae, Brachistinae, Braconinae, Cheloninae, Euphorinae, Gnaptodontinae, Helconinae, Macrocentrinae, Microgastrinae, Opiinae, Rogadinae, Sigalphinae) auf, die in verschiedenen Regionen des Iran gesammelt wurden und für diese neu sind.

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