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Original research

A faunistic study on Braconidae (Hymenoptera: Ichneumonoidea) from Iran, and in Memoriam Dr. Jenő Papp (20 May 1933-11 December 2017)

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Abstract: This paper deals with a faunstic survey on Iranian Braconidae (Hymenoptera). In total, 19 species belonging to six subfamilies Agathidinae (one species), Alysiinae (six species), Braconinae (seven species), Cheloninae (one species), Microgastrinae (one species) and Opiinae (three species) were collected and identified.

Keywords: Braconidae, parasitoid, new record, distribution, Iran

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Introduction

The family Braconidae is the second largest family of Hymenoptera (after Ichneumonidae) (Shaw and Huddleston, 1991; Sharkey, 1993). About 21,223 species of this family have been described so far under 45 subfamilies (Yu et al., 2016). These wasps are powerful parasitoids of other insects, especially agricultural pests (Wharton, 1993).

The fauna of Iranian Braconidae has been studied rather well and most of the taxa have been catalogued by several authors (e.g., Fallahzadeh and Saghaei, 2010; Gadallah and Ghahari, 2013a, 2013b, 2015, 2016, 2017; Gadallah et al., 2015a, 2015b, 2016a, 2016b, 2018; Ghahari, 2016; Farahani et al., 2016; Beyarslan et al., 2017). The total number of Iranian braconid species is more than 800 species in 151 genera and 28 subfamilies (Yu et al., 2016). Many new records were recently added to the Iranian fauna (e.g., Sakenin Chelav et al., 2018; Samin et al., 2018a, 2018b; Gadallah et al., 2018). In the present paper, 19 braconid species belonging to 15 genera and six subfamilies, Agathidinae, Alysiinae, Braconinae, Cheloninae, Microgastrinae and Opiinae are reported for the first time for the Iranian fauna.

Material and Methods

Samplings were done using Malaise traps, sweeping net and also many species were reared from the hosts under optimum conditions (25±2 ºC, 65±5% RH, 14: 10 L: D) in incubator. The specimens were preserved in alcohol 75% or mounted on triangular labels and examined with a stereoscopic binocular microscope. In this paper, the information concerning specific name, describer and description date, locality, date of collection, and number of specimens are given. Classification and distribution of each braconid species in the present study follow Yu et al. (2016)

Results

Totally 19 Braconidae species belong to six subfamilies and 15 genera were collected from different regions of Iran as new records. The list of species with distribution data is given below, alphabetically.

Subfamily: Agathidinae Haliday, 1833
Genus: *Agathis* Latreille, 1805
Genus: *Earinus* Wesmael, 1837
***Earinus gloriatorius* (Pazner, 1809)**
Material examined: Tehran province, Pishva, 2♂♂, 5.ix.2010, ex *Acleris variegana* (Denis & Schiffermüller, 1775) (Lepidoptera: Tortricidae).
General distribution: Austria, Azerbaijan, Belgium, Bulgaria, Czech Republic, Estonia, Finland, France, Germany, Hungary, Ireland, Latvia, Lithuania, Moldova, Mongolia, Netherlands, Norway, Poland, Russia, Slovakia, Sweden, Switzerland, Ukraine, United Kingdom.

Subfamily: Alysiinae Leach, 1815
Genus: *Adelphenaldis* Fischer, 2003
***Adelphenaldis globipes* (Fischer, 1962)**
Material examined: Guilan province, Siahkal (Siahbijar), 1♀, 16.vii.2008.
General distribution: Bulgaria, China, Czech Republic, Georgia, Hungary, Italy, Netherlands, Poland, Russia, Spain, Sweden.

Genus: *Alysia* Latreille, 1804
***Alysia* (*Anarcha*) *tipulae* (Scopoli, 1763)**
Material examined: Lorestan province, Alashtar (Mansoor-Abad), 2♀♀, 3.v.2009.
General distribution: Armenia, Austria, Belgium, Bulgaria, Croatia, Czech Republic, France, Georgia, Germany, Hungary, Ireland, Italy, Korea, Lithuania, Mongolia, Netherlands, Norway, Poland, Romania, Russia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, former Yugoslavia.

Genus: *Aphaereta* Foerster, 1863
***Aphaereta pallipes* (Say, 1828)**
Material examined: Golestan province, Golestan National Park, 2♀♀, 2♂♂, 21.ix.2007.
General distribution: Europe, Nearctic, Neotropical, Oceanic, and Palaearctic regions, Australia, United States of America.

Genus: *Chorebus* Haliday, 1833
***Chorebus* (*Phaenolexis*) *gracilis* (Nees, 1834)**
Material examined: Guilan province, Langrud (Sangtash), 2♀♀, 1♂, 11.viii.2010.
General distribution: Austria, Azerbaijan, Canada, former Czechoslovakia, Finland, France, Germany, Ireland, Kazakhstan, Poland, Russia, Serbia, Sweden, Switzerland, United Kingdom, former Yugoslavia.

***Coelinidea vidua* (Curtis, 1829)**
Material examined: Kuhgiloyeh and Boyerahmad, Lordegan (Shurab), 2♀♀, 19.vii.2005.
General distribution: Belgium, Finland, France, Germany, Hungary, Ireland, Italy, Korea, Mongolia, Poland, Russia, Serbia, Spain, Sweden, Switzerland, Ukraine, United Kingdom.

Genus: *Exotela* Forster, 1862
***Exotela umbellina* (Nixon, 1954)**
Material examined: Tehran province, Roodehen, 2♀♀, 15.ix.2015, collected by sweeping net on *Clematis* sp. (Ranunculaceae).
General distribution: Czech Republic, Germany, Hungary, Ireland, Poland, Portugal, Russia, Serbia and Montenegro, Sweden, Switzerland, Turkey, United Kingdom.

Subfamily: Braconinae Nees, 1811
Genus: *Iphiaulax* Forster, 1863
***Iphiaulax* (*Iphiaulax*) *potanini* (Kokujev, 1898)**
Material examined: Chaharmahal and Bakhtiari province, Ardal (Shuran), 2♀♀, 1♂, 5.v.2011.
General distribution: Mongolia, Tajikistan, Turkey, Turkmenistan.

Genus: *Bracon* Fabricius, 1804
***Bracon* (*Glabrobracon*) *discoideus* (Wesmael, 1838)**
Material examined: Hamadan province, Nahavand, 4♀♀, 11.vii.2009, ex *Anthonomus pomorum* (Coleoptera: Curculionidae) (Linnaeus, 1758).
General distribution: Armenia, Austria, Belgium, Bulgaria, Egypt, France, Germany, Hungary, Ireland, Italy, Kazakhstan, Kyrgyzstan, Moldova, Netherlands, Poland, Russia, Serbia, Slovakia, Slovenia, Sweden, Switzerland, Turkey, Ukraine, United Kingdom.

***Bracon* (*Glabrobracon*) *otiosus* Marshall, 1885**
Material examined: Hamadan province, Malayer, 2♀♀, 1♂, 13.vii.2009, ex *Anthonomus pomorum* (Linnaeus, 1758) (Coleoptera: Curculionidae).
General distribution: Austria, Finland, Georgia, Greece, Hungary, Korea, Lithuania, Netherlands, Norway, Poland,

Romania, Russia, Sweden, Switzerland, Turkey, Ukraine, United Kingdom.

***Bracon* (*Lucobracon*) *radiatus* Tobias, 1957**
Material examined: Kordestan province, Qorveh, (Shahabieh) 2♀♀, 14.viii.2008.
General distribution: Russia, Tajikistan, Turkey.

***Bracon* (*Glabrobracon*) *titubans* (Wesmael, 1838)**
Material examined: Kuhgiloyeh and Boyerahmad province, Sisakht, 2♀♀, 1♂, 26.vii.2009.
General distribution: Afghanistan, Armenia, Austria, Belgium, Bulgaria, Croatia, Finland, France, Georgia, Hungary, Germany, Korea, Mongolia, Netherlands, Poland, Romania, Russia, Slovakia, Slovenia, Sweden, Switzerland, Turkey, Ukraine, United Kingdom, former Yugoslavia.

Genus: *Vipio* Latreille, 1804
***Vipio shestakovi* Telenga, 1936**
Material examined: Chaharmahal and Bakhtiari province, Ardal (Shuran), 2♀♀, 5.v.2011.
General distribution: Turkey, Turkmenistan.

Genus: *Glyptomorpha* Holmgern, 1868
***Glyptomorpha* (*Glyptomorpha*) *elector* (Kokujev, 1898)**
Material examined: Qazvin province, Abyek (Aladaghlu), 1♀, 6.vi.2007.
General distribution: China, Hungary, Kazakhstan, Mongolia, Turkey, Turkmenistan, Uzbekistan.

Subfamily: Cheloninae Forster, 1863
Genus: *Chelonus* Panzer 1806
***Chelonus* (*Chelonus*) *corvulus* Marshall, 1885**
Material examined: Mazandaran province, Qaemshahr (Sarokola), 3♀♀, 11.ix.2006, ex *Spodoptera exigua* (Hübner, 1808) (Lepidoptera, Noctuidae).
General distribution: Austria, China, Croatia, Czech Republic, Finland, France, Germany, Greece, Hungary, India, Iran, Italy, Kazakhstan, Moldova, Mongolia, Montenegro, Poland, Romania, Russia, Serbia, Slovenia, Spain, Switzerland, Tajikistan, United Kingdom.

Subfamily: Microgastrinae Forster, 1862
Tribe Apantilini Viereck, 1918
Genus: *Apanteles* Forster, 1862
***Apanteles* (*Choeras*) *parasitellae* (Bouché, 1834)**
Material examined: Tehran province, Shahriar, 3♀♀, 10.ix.2010, ex *Yponomeuta padella* (Linnaeus) (Lepidoptera: Yponomeutidae) on apricot.
General distribution: Austria, Belgium, Czech Republic, Finland, France, Georgia, Germany, Hungary, Israel, Italy, Korea, Latvia, Moldova, Netherlands, Poland, Romania, Russia, Serbia and Montenegro, Slovakia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom, Uzbekistan.

Subfamily: Opiinae Blanchard, 1845
Genus: *Opius* Wesmael, 1835
***Opius* (*Hypocynodus*) *larissa* Fischer, 1968**
Material examined: Razavi Khorasan province, Soltan-Abad, 1♀, 7.vi.2008.
General distribution: Afghanistan, Greece, Hungary, Korea, Mongolia, Turkey.

***Opius* (*Tolbia*) *caesus* Haliday, 1837**
Material examined: Fars province, Abadeh (Chehl-Cheshmeh), 2♀♀, 13.v.2009.
General distribution: Austrai, Bulgaria, former Czechoslovakia, Denmark, Finland, France, Germany, Hungary, Iceland, Ireland, Israel, Italy, Lithuania, Nepal, Poland, Romania, Russia, Serbia, Spain, Sweden, Switzerland, Syria, Tajikistan, Turkey, United States of America.

Genus: *Phaedrotoma* Forster, 1862
***Phaedrotoma variegata* (Szépligeti, 1896)**
Material examined: Tehran province, Pak-Dasht, 2♂♂, 25.vii.2011, ex *Chromatomyia horticola* (Goureau, 1851) (Diptera: Agromyzidae) on Polygonaceae.
General distribution: Austria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Kazakhstan, Mongolia, Netherlands, Poland, Russia, Slovakia, Spain, Sweden, Switzerland, Turkey, United Kingdom.

Discussion

In this paper 19 species are represented as new country records, which with 861 recorded species (Samin et al., 2018b), the total number of Iranian Braconidae reaches to 880 (Fig.). Finding new records continuously by different authors in different regions of Iran proves that the fauna of these parasitoids was poorly been studied in the country. During several faunistic surveys by the first author in

various geographical regions of Iran, it is expected much more species of Braconidae for the fauna of Iran, which we estimate over than 2000 species. Continuing of faunistic survey systematically will result to be findings (new distribution data, new host records, new country records, and even new species). On the other hand, since braconid wasps are efficient parasitoids in the most agricultural and forest ecosystems, determining of their hosts can be the first step for biological control programs.

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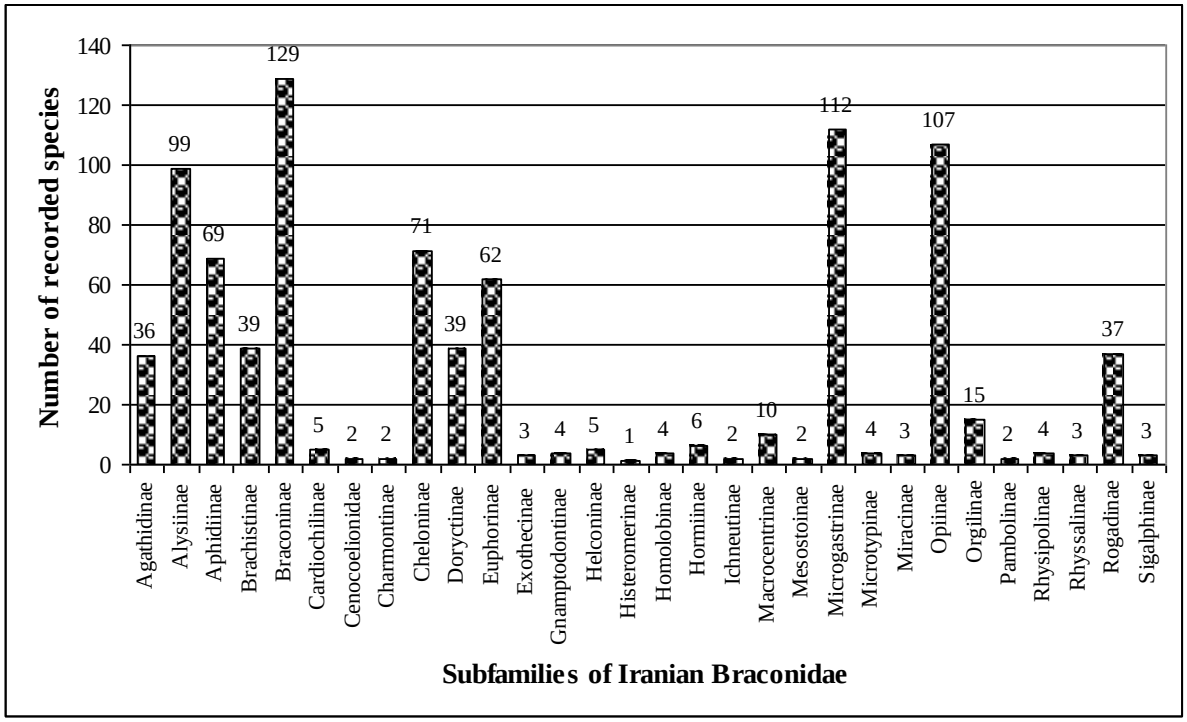

Figure. Species diversity of Iranian Braconidae (based on Samin et al. 2018b and the present study).

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In Memoriam Dr. Jenő Papp (20 May 1933-11 December 2017)

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Dr. Jenő Papp in Bakony Museum of Hungarian Natural History Museum, 2010 (photographer: Cs. Kutasi).

Dr. Jenő Papp was born on 20 May 1933 in Budapest.

He graduated as certified zoologist at the Lorand Eötvös University, Budapest 1951-1956, and obtained Ph.D in 1976. Title of his Ph.D dissertation was "Evolutionary trends of the braconid species *Apanteles* and their significance in the biological control". In January 1970, he was appointed as the curator of Hymenoptera Collection and principal research worker (senior entomologist) of the Hungarian Natural History Museum (Department of Zoology). In December 1993 chief conselor's title was conferred to him by the Directorate of Hungarian Natural History Museum.

Nearly six decades he was a specialist of braconid wasps, a significant family group within Hymenoptera. He studied their taxonomy, systematics, faunistic, zoogeography and their role in biological control of agricultural and forest pests. In his braconidologist's capacity he published 340 papers (about 5000 printed pages) in Hungarian and foreign (21 countries) periodicals. He took study tours to natural history as well as zoological museums of 18 cities in total: Athens, Berlin, Brno, Dresden, Eberswalde, Innsbruck, Krakow, Leiden, London, Lund, Munich, Paris, Praha, Saint Petersburg, Wageningen, Warszawa, Wien, and Yerevan.

During his 60 years of research activity, Dr. Papp identified numerous specimens of Braconidae from different countries of Palaearctic regions, several new records for different countries and of course several, over 800 new species for the science too.

I (H. Ghahari) visited Jenő only once and I found him a kind and respectable scientist. He was always ready to receive the specimens collected by me and some other Iranian colleagues, and identified truthfully - without any expectation. It is my honor that we published six co-authored papers on Iranian Braconidae (see references).

Dr. Jenő Papp died on 11 December 2017 in Budapest.

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