

A Study on the Ichneumonid Wasps (Hymenoptera: Ichneumonidae) from Isfahan Province, Iran

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(Received: 6 April 2015; accepted: 4 June 2015)

The fauna of ichneumonid wasps (Hymenoptera: Ichneumonidae) from Isfahan province (Iran) is studied in this paper. In total 28 species from 24 genera and 6 subfamilies (Campopleginae, Cryptinae, Ichneumoninae, Ophioninae, Pimplinae and Tryphoninae) were collected and identified. *Encrateola laevigata* (Ratzeburg, 1848), *Mesoleptus laticinctus* (Walker, 1874) (Cryptinae), *Hepiopelmus melanogaster* (Gmelin, 1790) (Ichneumonidae), and *Apechthis quadridentata* (Thomson, 1877) (Pimplinae) are new records for the fauna of Iran.

Keywords: Hymenoptera, Ichneumonidae, fauna, Isfahan, Iran.

Ichneumonidae (Hymenoptera) is the biggest hymenopteran family with 51 generally recognized subfamilies, 1579 genera and 24,281 described species, with an estimated 60,000 extant species (Townes, 1969; Yu et al., 2012; Çoruh et al., 2014). Ichneumonidae is represented with about 8711 species in the Palaearctic region (Yu et al., 1997). Ichneumonids are parasitoids of immature holometabolous insects such as Coleoptera, Diptera, Hymenoptera, Lepidoptera, Raphidioptera, Trichoptera and also other arthropods such as Chelicerata, adult Araneae and Pseudoscorpionida (Townes, 1969). The number of known species of Ichneumonidae increases rapidly in the world (Çoruh et al., 2014).

Due to the great diversity and difficulties in identification of many species in this group, our knowledge of the Iranian fauna remains insufficient. The Ichneumonidae fauna of Iran is not well studied. In the checklist from Barahoei et al. (2012) 502 species belonging to 189 genera and 24 subfamilies are listed from Iran. Later, many authors (Barahoei et al., 2014a, b, 2015; Ghahari and Jussila, 2014a, b, 2015) have made contributions to the Iranian fauna. The most important faunistic work on the ichneumonids of Isfahan province was conducted by Barahoei et al. (2015), who reported 18 species from 16 genera and 7 subfamilies. Additionally Barahoei et al. (2014b) reported 9 species from 9 genera of the subfamily Cryptinae from Isfahan province.

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Isfahan province (32.6577°N 51.6692°E) is located in the center of the country and covers an area of approximately 107,027 km². The province has a moderate and dry climate on the whole, ranging between 40.6 °C and 10.6 °C on a cold day in the winter season. The average annual temperature has been recorded as 16.7 °C and the annual rainfall on an average has been reported as 116.9 mm. The aim of this paper is to increase the knowledge of the ichneumonid fauna in Isfahan province.

Materials and Methods

Through the samplings by Malaise trap and sweeping net for collecting the ichneumonid wasps in different regions of Isfahan province several specimens were collected. The sampled regions in this research are Anarak, Aran-Bidgol, Ardestan, Fereydun-Shahr, Golpaygan, Isfahan, Kashan, Khansar, Khomeyni-Shahr, Nain, Najaf-Abad, Semirom, Shahreza. Classification and nomenclature of Ichneumonidae suggested by Yu et al. (2012) have been followed.

Results

In a total 28 ichneumonid species from 24 genera and subgenera and 6 subfamilies were collected from different regions of Isfahan province. The list of species is given below alphabetically.

Subfamily Campopleginae Genus *Diadegma* Förster, 1869

Diadegma fenestrata (Holmgren, 1860)

Material examined: Isfahan province, Aran-Bidgol (34°03'28"N 51°29'03"E), 1♀, 1♂, April 2012.

Distribution outside Iran: Afghanistan, Austria, Azerbaijan, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Hungary, Iceland, India, Ireland, Israel, Italy, Japan, Kazakhstan, Latvia, Lithuania, Moldova, Morocco, the Netherlands, New Zealand, Norway, Pakistan, Philippines, Poland, Portugal, Romania, Russia, Spain, Sri Lanka, Sweden, Switzerland, Turkey, Turkmenistan, Ukraine, UK, former Yugoslavia (Yu et al., 2012).

Genus *Lemophagus* Townes, 1965

Lemophagus curtus Townes, 1965

Material examined: Isfahan province, Anarak (33°18'40"N 53°41'54"E), 1♀, April 2006.

Distribution outside Iran: Austria, Bulgaria, Czech Republic, Denmark, France, Germany, Italy, Poland, Romania, Russia, Sweden, Switzerland, USA, Ukraine, UK (Yu et al., 2012).

Subfamily Cryptinae
Genus *Aclastus* Förster, 1869

***Aclastus gracilis* (Thomson, 1884)**

Material examined: Isfahan province, Fereydun-Shahr (32°56'28"N 50°07'16"E), 1♀, June 2006.

Distribution outside Iran: Austria, Azerbaijan, Belgium, Bulgaria, Canary Islands, former Czechoslovakia, Denmark, Faeroe Islands, Finland, France, Germany, Greenland, Hungary, Iceland, Ireland, Italy, Madeira Islands, the Netherlands, Norway, Poland, Russia, Spain, Sweden, Switzerland, Turkey, UK (Yu et al., 2012).

Genus *Agrothereutes* Förster, 1850

***Agrothereutes parvulus* (Habermehl, 1926)**

Material examined: Isfahan province, Aran-Bidgol (34°03'28"N 51°29'03"E), 2♂, April 2012.

Distribution outside Iran: Bulgaria, France, Poland, Spain, Turkey (Yu et al., 2012).

Genus *Cryptus* Fabricius, 1804

***Cryptus minator* Gravenhorst, 1829**

Material examined: Isfahan province, Golpaygan (33°27'13"N 50°17'18"E), 1♀, September 2005.

Distribution outside Iran: Austria, Bulgaria, former Czechoslovakia, Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Norway, Poland, Romania, Spain, Sweden, Turkey, UK (Yu et al., 2012).

Genus *Encrateola* Strand, 1916

***Encrateola laevigata* (Ratzeburg, 1848)**

Material examined: Isfahan province, Isfahan (32°38'N 51°39'E), 1♂, July 2006.
New record for the fauna of Iran.

Distribution outside Iran: Afghanistan, Austria, Bulgaria, Canada, Czech Republic, Finland, France, Germany, Hungary, Ireland, Lithuania, Moldova, the Netherlands, Norway, Poland, Romania, South Africa, Sweden, Turkey, USA, Ukraine, UK (Yu et al., 2012).

Genus *Gelis* Thunberg, 1827

***Gelis agilis* (Fabricius, 1775)**

Material examined: Isfahan province, Khansar (33°13'14"N 50°18'54"E), 2♀, April 2005. Isfahan province, Nain (32°51'36"N 53°05'15"E), 1♀, July 2008.

Distribution outside Iran: Albania, Austria, Azerbaijan, Belarus, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland,

Ireland, Italy, Latvia, Lithuania, Moldova, the Netherlands, Norway, Poland, Romania, Russia, Spain, Sweden, Switzerland, Turkey, Ukraine, UK (Yu et al., 2012).

***Gelis areator* (Panzer, 1804)**

Material examined: Isfahan province, Ardestan (33°22'34"N 52°22'10"E), 1♀, June 2012. Isfahan province, Shahreza (32°00'32"N 51°52'00"E), 2♀, 1♂, September 2008.

Distribution outside Iran: Austria, Azerbaijan, Belarus, Belgium, Bulgaria, China, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Italy-Sicily, Japan, Korea, Latvia, Lithuania, Macedonia, Moldova, the Netherlands, New Zealand, Norway, Poland, Romania, Russia, Serbia and Montenegro, Slovakia, South Africa, Spain, Sweden, Switzerland, Ukraine, UK, former Yugoslavia (Yu et al., 2012).

Genus *Hoplocryptus* Thomson, 1873

***Hoplocryptus femoralis* (Gravenhorst, 1829)**

Material examined: Isfahan province, Semirom (31°24'51"N 51°34'10"E), 1♀, 1♂, August 2008.

Distribution outside Iran: Algeria, Bulgaria, Croatia, Egypt, France, Germany, Greece, Israel, Italy, Italy-Sardinia, Italy-Sicily, Kazakhstan, Kyrgyzstan, Macedonia, Norway, Poland, Romania, Slovenia, Spain, Sweden, Tajikistan, Tunisia, Turkey, former Yugoslavia (Yu et al., 2012).

Genus *Ischnus* Gravenhorst, 1829

***Ischnus agitator* (Olivier, 1792)**

Material examined: Isfahan province, Kashan (33°59'20"N 51°28'38"E), 1♀, August 2007.

Distribution outside Iran: Austria, Azerbaijan, Bulgaria, Croatia, former Czechoslovakia, Denmark, France, Germany, Greece, Hungary, Ireland, Italy, Italy-Sardinia, Italy-Sicily, Latvia, Poland, Romania, Spain, Sweden, Tunisia, Turkey, UK (Yu et al., 2012).

Genus *Meringopus* Förster, 1869

***Meringopus titillator* (Linnaeus, 1758)**

Material examined: Isfahan province, Najaf-Abad (33°10'04"N 51°35'00"E), 1♀, 2♂, August 2013.

Distribution outside Iran: Afghanistan, Algeria, Armenia, Austria, Azerbaijan, Bulgaria, China, Croatia, Cyprus, Czech Republic, Denmark, Egypt, Finland, France, Germany, Greece, Hungary, Ireland, Isle of Man, Israel, Italy, Italy-Sardinia, Italy-Sicily, Jordan, Kyrgyzstan, Latvia, Morocco, the Netherlands, Norway, Palestine, Poland, Romania, Russia, Serbia and Montenegro, Spain, Sweden, Switzerland, Syria, Tajikistan, Tunisia, Turkey, Turkmenistan, Ukraine, UK, Uzbekistan, former Yugoslavia (Yu et al., 2012).

Genus *Mesoleptus* Gravenhorst, 1829

Mesoleptus laticinctus (Walker, 1874)

Material examined: Isfahan province, Nain (32°51'36"N 53°05'15"E), 1♂, July 2008. **New record for the fauna of Iran.**

Distribution outside Iran: Austria, Azerbaijan, Belgium, Bulgaria, China, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Japan, Korea, Lithuania, Norway, Poland, Romania, Russia, Spain, Sweden, Switzerland, Turkey, Ukraine, UK (Yu et al., 2012).

Mesoleptus incessor (Haliday, 1838)

Material examined: Isfahan province, Khansar (33°13'14"N 50°18'54"E), 2♂, April 2005.

Distribution outside Iran: Austria, Azerbaijan, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Moldova, the Netherlands, Norway, Poland, Romania, Russia, Spain, Sweden, Switzerland, Turkey, Ukraine, UK (Yu et al., 2012).

Genus *Synechocryptus* Schmiedeknecht, 1904

Synechocryptus persicator Aubert, 1986

Material examined: Isfahan province, Shahreza (32°00'N 51°52'E), 1♀, September 2009.

Distribution outside Iran: Armenia, Turkey (Yu et al., 2012).

Subfamily Ichneumoninae Genus *Barichneumon* Thomson, 1893

Barichneumon albicaudatus (Fonscolombe, 1847)

Material examined: Isfahan province, Nain (32°51'36"N 53°05'15"E), 1♀, July 2008.

Distribution outside Iran: Austria, Azerbaijan, Belgium, Bulgaria, Croatia, France, Germany, Hungary, Italy, Kazakhstan, Lithuania, Macedonia, Poland, Romania, Russia, Spain, Turkey, UK, former Yugoslavia (Yu et al., 2012).

Genus *Coelichneumon* Thomson, 1893

Coelichneumon dorsosignatus (Berthoumieu and Eversmann, 1894)

Material examined: Isfahan province, Kashan (33°59'20"N 51°28'38"E), 2♂, August 2007.

Distribution outside Iran: Algeria, Austria, Azerbaijan, Germany, Kazakhstan, Poland, Romania, Russia, Spain, Turkey (Yu et al., 2012).

Genus *Ctenichneumon* Thomson, 1894

Ctenichneumon repentinus (Gravenhorst, 1820)

Material examined: Isfahan province, Kashan (33°59'20"N 51°28'38"E), 2♂, August 2007.

Distribution outside Iran: Austria, Azerbaijan, Belarus, Belgium, Bulgaria, Croatia, former Czechoslovakia, Finland, France, Germany, Greece, Hungary, Italy, Italy-Sicily, the Netherlands, Norway, Poland, Romania, Russia, Spain, Turkey, Ukraine, UK (Yu et al., 2012).

Genus *Hepiopelmus* Wesmael, 1845

Hepiopelmus melanogaster (Gmelin, 1790)

Material examined: Isfahan province, Khomeyni-Shahr (32°42'01"N 51°31'16"E), 1♂, October 2007. **New record for the fauna of Iran.**

Distribution outside Iran: Austria, Belarus, Belgium, Bosnia Hercegovina, Bulgaria, former Czechoslovakia, Finland, France, Germany, Hungary, Ireland, Italy, Japan, Latvia, Lithuania, the Netherlands, Norway, Poland, Romania, Russia, Spain, Sweden, Switzerland, Turkey, UK, former Yugoslavia (Yu et al., 2012).

Genus *Ichneumon* Linnaeus, 1758

Ichneumon coniger Tischbein, 1876

Material examined: Isfahan province, Semirom (31°24'51"N 51°34'10"E), 1♀, August 2008.

Distribution outside Iran: Austria, Bulgaria, Croatia, France, Germany, Hungary, Poland, Romania, Serbia, Spain, Sweden, Turkey, Ukraine, former Yugoslavia (Yu et al., 2012).

Ichneumon lautatorius Desvignes, 1856

Material examined: Isfahan province, Isfahan (1592 m), 1♀, July 2006. Isfahan province, Shahreza (32°00'32"N 51°52'00"E), 2♀, September 2008.

Distribution outside Iran: Austria, Belgium, Bulgaria, China, France, Germany, Hungary, Italy, the Netherlands, Poland, Romania, Spain, Turkey, UK (Yu et al., 2012).

Ichneumon ostentator Heinrich, 1978

Material examined: Isfahan province, Golpaygan (33°27'13"N 50°17'18"E), 1♂, 1♀, August 2008.

Distribution outside Iran: Greece, Spain, Turkey, UK, former Yugoslavia (Yu et al., 2012).

Subfamily Ophioninae
Genus *Enicospilus* Stephens, 1835

***Enicospilus ramidulus* (Linnaeus, 1758)**

Material examined: Isfahan province, Golpaygan (33°27'13"N 50°17'18"E), 1♀, September 2005. Isfahan province, Fereydun-Shahr (32°56'28"N 50°07'16"E), 1♀, 1♂, June 2006.

Distribution outside Iran: Afghanistan, Algeria, Austria, Azerbaijan, Belarus, Belgium, Bulgaria, Canary Islands, China, Croatia, Czech Republic, Denmark, Egypt, Ethiopia, Finland, France, Germany, Hungary, Ireland, Israel, Italy, Japan, Kazakhstan, Korea, Latvia, Macedonia, Moldova, the Netherlands, Norway, Poland, Romania, Russia, Spain, Sweden, Switzerland, Turkey, Ukraine, UK, former Yugoslavia (Yu et al., 2012).

Genus *Ophion* Fabricius, 1798

***Ophion luteus* (Linnaeus, 1758)**

Material examined: Isfahan province, Aran-Bidgol (34°03'28"N 51°29'03"E), 1♀, April 2012.

Distribution outside Iran: Algeria, Argentina, Australia, Austria, Azerbaijan, Belarus, Belgium, Bulgaria, Canada, Canary Islands, Chile, China, Croatia, Cyprus, Czech Republic, Estonia, Finland, France, Germany, Greece, Greenland, Hungary, Iceland, India, Ireland, Italy, Italy-Sardinia, Italy-Sicily, Japan, Korea, Latvia, Lebanon, Lithuania, Moldova, Mongolia, Morocco, the Netherlands, Norway, Poland, Portugal, Romania, Russia, Spain, Sweden, Switzerland, Syria, Turkey, USA, Ukraine, UK, former Yugoslavia (Yu et al., 2012).

Subfamily Pimplinae
Genus *Apechthis* Förster, 1869

***Apechthis quadridentata* (Thomson 1877)**

Material examined: Isfahan province, Anarak (33°18'40"N 53°41'54"E), 1♀, April 2006. **New record for the fauna of Iran.**

Distribution outside Iran: Albania, Armenia, Austria, Azerbaijan, Belarus, Belgium, Bulgaria, China, Croatia, Czech Republic, Finland, France, Georgia, Germany, Greece, Hungary, Ireland, Italy, Japan, Kazakhstan, Lithuania, Macedonia, Moldova, Mongolia, the Netherlands, Norway, Poland, Romania, Russia, Serbia and Montenegro, Slovakia, Spain, Sweden, Switzerland, Turkey, Ukraine, UK, former Yugoslavia (Yu et al., 2012).

Genus *Pimpla* Fabricius, 1804

***Pimpla insignatoria* (Gravenhorst, 1807)**

Material examined: Isfahan province, Shahreza (32°00'32"N 51°52'00"E), 1♂, September 2008.

Distribution outside Iran: Armenia, Austria, Azerbaijan, Belarus, Bulgaria, Croatia, Czech Republic, Denmark, France, Georgia, Germany, Hungary, Macedonia, the Netherlands, Poland, Romania, Russia, Turkey, Ukraine, UK, former Yugoslavia (Yu et al., 2012).

Genus *Tromatobia* Förster, 1869

***Tromatobia ovivora* (Boheman, 1821)**

Material examined: Isfahan province, Fereydun-Shahr (32°56'28"N 50°07'16"E), 1♀, June 2006.

Distribution outside Iran: Austria, Azerbaijan, Belarus, Belgium, Bulgaria, Canada, Croatia, Czech Republic, Finland, France, Germany, Hungary, Ireland, Italy, Italy-Sicily, Japan, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Macedonia, Mexico, Mongolia, the Netherlands, Norway, Poland, Romania, Russia, Serbia and Montenegro, Spain, Sweden, Switzerland, Turkey, USA, UK, former Yugoslavia (Yu et al., 2012).

Subfamily Tryphoninae **Genus *Kristotomus* Mason, 1962**

***Kristotomus laetus* (Gravenhorst, 1829)**

Material examined: Isfahan province, Khansar (33°13'14"N 50°18'54"E), 2♀, April 2005.

Distribution outside Iran: Armenia, Austria, Belgium, Bulgaria, former Czechoslovakia, Denmark, Finland, France, Georgia, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Mongolia, the Netherlands, Norway, Poland, Romania, Russia, Spain, Sweden, Switzerland, Turkey, Ukraine, UK (Yu et al., 2012).

Genus *Phytodietus* Agassiz, 1846

***Phytodietus polyzonias* (Forster, 1771)**

Material examined: Isfahan province, Semirom (31°24'51"N 51°34'10"E), 1♀, August 2008.

Distribution outside Iran: Armenia, Austria, Azerbaijan, Belarus, Belgium, Bulgaria, China, Czech Republic, Denmark, Finland, France, Georgia, Germany, Hungary, Ireland, Italy, Kazakhstan, Korea, Latvia, Lithuania, Moldova, the Netherlands, Norway, Poland, Romania, Russia, Serbia and Montenegro, Slovakia, Spain, Sweden, Switzerland, Turkey, Ukraine, UK (Yu et al., 2012).

Discussion

In this research 28 species from 24 genera of the family Ichneumonidae were identified from different regions of Isfahan province. The results of this survey indicate the existence of a diverse range of the ichneumonids in the mentioned region. Several of the collected Ichneumonidae are still waiting for subsequent determinations. The Ichneumonidae is the largest family within Hymenoptera, and one of the largest among insects (Humala and Reshchikov, 2014). Although in total more than 500 species of Ichneumonidae have been listed from Iran so far (Barahoei et al., 2012), the published data from the adjacent countries and also presence of various geographical regions and climates in Iran suggest that the Iranian list is still very incomplete. The faunistic works on Iranian Ichneumonidae are continued in different areas and so these surveys will result to new data toward the completing of Iranian Ichneumonidae list.

Acknowledgements

The authors are grateful to R. Jussila (Finland) and M. Schwarz (Austria) for their cooperation in this research. The research was supported by Islamic Azad University (Yadegar – e-Imam Khomeini (RAH) Branch), Iran and Cairo University, Egypt.

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