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AUTHORS: Janko Kolarov, Neveen S. Gadallah, Hassan Ghahari, Reijo Jussila

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New and Little-Known Species of Ichneumonidae (Hymenoptera) for the Iranian Fauna

Janko KOLAROV¹

Neveen S. GADALLAH²

Hassan GHAHARI^{3*}

Reijo JUSSILA⁴

¹Faculty of Pedagogie, University of Plovdiv, Plovdiv, BULGARIA

²Entomology Department, Faculty of Science, Cairo University, Giza, EGYPT

³Department of Agriculture, Yadegar-e-Imam Khomeini (RAH) Shahre Rey Branch, Islamic Azad University, Tehran, IRAN

⁴Zoological Museum, Department of Biology, University of Turku, FINLAND

e-mails: ¹jkolarov@uni-plovdiv.bg, ²n_gadallah@cu.edu.eg, ³*hghahari@yahoo.com

⁴reijo.jussila@utu.fi

ORCID IDs: ¹0000-0002-0027-4162, ²0000-0002-4381-9599, ³0000-0001-6781-3776

*Corresponding author

ABSTRACT

This paper deals with faunistic surveys on Ichneumonidae (Hymenoptera) of Iran. In total, 18 species in eight subfamilies are recorded as new for the fauna of the country: Anomaloniinae (one species), Banchinae (three species), Campopleginae (three species), Ctenopelmatinae (two species), Metopiinae (one species), Orthocentrinae (three species), Phygadeuontinae (two species), and Tryphoninae (three species).

Keywords: Faunistic list, new records, distribution, host records, Iran, Middle East.

INTRODUCTION

Darwin wasps (Ichneumonidae), are one of the most species-rich groups of the tree of life (Klopstein et al., 2019a), consisting of 1,601 genera and more than 25,300 described species worldwide (Yu, van Achterberg, & Horstmann, 2016). However, the knowledge of their true diversity is still lacking (Klopstein et al., 2019a), and an estimated 60,000–100,000 species are still waiting formal descriptions (Townes, 1969; Gauld, Sithole, Gomez, & Godoy, 2002; Meier et al., 2024).

The majority of ichneumonid species feed as larvae onto or into the pupae or larvae of other holometabolous insects (especially larvae and pupae of Lepidoptera) or spiders (Takasuka & Broad, 2024). Others parasitize the prepupae or pupae of aculeate Hymenoptera or woodboring beetles (Wahl, 1993; Huber, 2009; Broad, Shaw, & Fitton, 2018). Despite their abundance and widespread occurrence in most habitats, especially in forests rather than in grasslands and agricultural habitats, comparatively few ichneumonids have been used successfully in biological control programs (Sime & Brower, 1998; Huber, 2009; Quicke, 2015).

In Iran, over 622 species have been recorded so far (Yu et al., 2016; Karimi et al., 2023), while many unrecorded and undescribed species are still awaiting. The purpose of this paper is to represent 18 new species records as part of ongoing faunistic studies of Ichneumonidae in Iran.

MATERIAL AND METHODS

The paper is based on the collected ichneumonid material from different localities and altitudes of Iran by Malaise traps, light traps and sweeping net, and placed in ethanol 75%. Then the specimens were mounted on triangular labels, and sorted to subfamily following Broad et al. (2018) the genera have been identified by employing different identification keys (e.g., Townes, 1969, 1970a, b, 1971; Bennett, 2015). The specimens were identified or confirmed by the first and last authors, and with the help of J. Sawoniewicz (University of Białystok, Poland). All the specimens are deposited in the collections of the determiners. Classification, nomenclature, distributional data and host records are reported following Yu et al. (2016), and other related references are given.

RESULTS

In total, 18 new species records of Ichneumonidae in eight subfamilies, Anomaloninae, Banchinae, Campopleginae, Ctenopelmatinae, Metopiinae, Orthocentrinae, Phygadeuontinae, and Tryphoninae were collected and identified from different regions of Iran. The list of species is given below alphabetically, together with distribution and host data.

Subfamily Anomaloninae Viereck, 1918**Genus *Heteropelma* Wesmael, 1849*****Heteropelma megarthrum* (Ratzeburg, 1848)**

Material examined: Razavi Khorasan province, Fariman, Kalateh-Khosh, 2♀, April 2011; Golestan province, Kordkoy, Salikandeh, 1♂, August 2017.

General distribution: Austria, Belarus, Belgium, Bulgaria, China, Czech Republic, Finland, France, Georgia, Germany, Hungary, India, Ireland, Italy, Japan, Kazakhstan, Korea, Latvia, Lithuania, Moldova, Mongolia, Netherlands, Norway, Poland, Romania, Russia, Sweden, Türkiye, Ukraine, United Kingdom (Yu et al., 2016), Iran (new record), Slovakia (Holý & Zeman, 2018), Switzerland (Klopfstein, Riedel, & Schwarz, 2019b).

Host records: The following hosts are summarized by Yu et al. (2016) for *H. megarthrum*: *Ochropacha duplaris* (Linnaeus) (Lepidoptera: Drepanidae), *Arichanna melanaria* (Linnaeus), *Bupalus piniarius* (Linnaeus), and *Ematurga atomaria* (Linnaeus) (Lepidoptera: Geometridae), *Anarta myrtilli* (Linnaeus), *Panolis flammea* (Denis and Schiffermüller), and *Polychrysis moneta* (Fabricius) (Lepidoptera: Noctuidae), *Bena prasinana* (Linnaeus) (Lepidoptera: Nolidae), *Araschnia levana* (Linnaeus) (Lepidoptera: Nymphalidae), and *Sphinx pinastri* Linnaeus (Lepidoptera: Sphingidae).

Subfamily Banchinae Wesmael, 1845**Genus *Alloplasta* Foerster, 1869*****Alloplasta piceator* (Thunberg, 1822)**

Material examined: Chaharmahal & Bakhtiari province, Lordegan, 1♀, 1♂, June 2015.

General distribution: Austria, Belgium, Bulgaria, Canada, China, Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Luxembourg, Moldova, Netherlands, Norway, Poland, Romania, Russia, Spain, Sweden, Switzerland, Türkiye, United States of America, Ukraine, United Kingdom (Yu et al., 2016), Czech Republic, Slovakia (Holý & Zeman, 2018), Iran (new record).

Host records: *Alloplasta piceator* was recorded as a parasitoid of the two noctuid species, *Orthosia gothica* (Linnaeus), and *Orthosia gracilis* (Denis and Schiffermüller) (Brock, 2017; Broad et al., 2018). Other host records mentioned in Yu et al. (2016) have been reported but not confirmed recently (Crowley & Broad, 2023).

Genus *Glypta* Gravenhorst, 1829***Glypta bifoveolata* Gravenhorst, 1829**

Material examined: Mazandaran province, Ramsar, Dalkhani forest, 3♀, July 2013.

General distribution: Austria, Belarus, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Israel, Italy, Latvia,

Lithuania, Luxembourg, Moldova, Mongolia, Netherlands, Norway, Poland, Romania, Russia, Spain, Sweden, Switzerland, Türkiye, Ukraine, United Kingdom (Yu et al., 2016), Iran (new record), Slovakia (Holý & Zeman, 2018).

Host records: The following lepidopteran hosts are summarized by Yu et al. (2016) as hosts for *G. bifoveolata*: *Bupalus piniarius* (Linnaeus) (Geometridae), *Xestia castanea* (Esper) (Noctuidae), *Dichrorampha simpliciana* (Haworth), *Epiblema foenella* (Linnaeus), *Hedya salicella* (Linnaeus), and *Zeiraphera griseana* (Hübner) (Tortricidae), and *Zygaena filipendulae* (Linnaeus) (Zygaenidae).

***Glypta vulnerator* Gravenhorst, 1829**

Material examined: Guilan province, Astara, Sheykh-Mahalleh, 1♂, 7 July 2012.

General distribution: Austria, Belgium, Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Moldova, Poland, Romania, Russia, Spain, Sweden, Switzerland, Türkiye, United Kingdom (Yu et al., 2016), Czech Republic (Holý & Zeman, 2018), Iran (new record).

Host records: The following lepidopterans have been summarized by Yu et al. (2016) as hosts for *G. vulnerator*: *Cochylimorpha hilarana* (Herrich-Schäffer), *Epiblema foenella* (Linnaeus), *Eucosma cana* (Haworth), and *Pammene gallicana* (Guenée) (Tortricidae).

Subfamily Campopleginae Foerster, 1869

Genus *Cymodusa* Holmgren, 1859

***Cymodusa exilis* Holmgren, 1860**

Material examined: Isfahan province, Najaf-Abad, Lavark Research field, 1♀, September 2013; Kuhgiluyeh & Boyerahmad province, Pataveh, 1♀, 2♂, September 2015.

General distribution: Armenia, Austria, Azerbaijan, Belgium, Bulgaria, Finland, France, Georgia, Germany, Greece, Hungary, Ireland, Israel, Italy, Moldova, Mongolia, Norway, Poland, Portugal, Romania, Russia, Spain, Sweden, Switzerland, Tajikistan, United Kingdom, Uzbekistan (Yu et al., 2016), Czech Republic (Holý & Zeman, 2018), Iran (new record).

Host records: *C. exilis* has been reared from *Scythris crassiuscula* (Herrich-Schäffer) (Lepidoptera: Scythrididae) (Shaw et al., 2016).

Genus *Diadegma* Foerster, 1869

***Diadegma chrysostictos* (Gmelin, 1790)**

Material examined: Guilan province, Astara, Asgar-Abad, 2♀, 2♂, September 2015.

General distribution: Austria, Azerbaijan, Azores, Belgium, Bosnia-Herzegovina, Bulgaria, Canada, Croatia, Czech Republic, Denmark, Egypt, Finland, France, Germany, Hungary, Ireland, Israel, Italy, Latvia, Lithuania, Moldova, Morocco, Netherlands, Norway, Poland, Portugal, Romania, Russia, Spain, Sweden, Tajikistan,

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Tunisia, Türkiye, United States of America, Ukraine, United Kingdom, Uzbekistan (Yu et al., 2016), Iran (new record), Slovakia (Holy & Zeman, 2018).

Host records: The following lepidopterans have been recorded by Shaw et al. (2016) as hosts for *D. chrysostictos*: *Scrobipalpa ocellatella* (Boyd) (Gelechiidae), *Endrosis* sp. (Oecophoridae), *Ephestia elutella* (Hübner), and ?*Ephestia kuehniella* Zeller (Pyrilidae), *Monolis laevigella* (Denis and Schiffermüller) (Tineidae), and *Kessleria saxifragae* (Stainton) (Yponomeutidae).

Genus *Dusona* Cameron, 1901

***Dusona polita* (Foerster, 1868)**

Material examined: Kordestan province, Baneh, Kani-Chulkeh, 1♂, 5 July 2011.

General distribution: Algeria, Austria, Azerbaijan, Belgium, Bulgaria, Czech Republic, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Luxembourg, Moldova, Netherlands, Norway, Poland, Romania, Russia, Slovakia, Spain, Sweden, Ukraine, United Kingdom (Yu et al., 2016), Iran (new record), Switzerland (Klopfstein, Riedel & Schwarz, 2019b).

Host records: Recorded by Shaw et al. (2016) as being a parasitoid of the geometrid *Erannis defoliaria* (Clerck), and the noctuid *Orthosia cruda* (Denis & Schiffermüller).

Subfamily Ctenopelmatinae Foerster, 1869

Genus *Rhorus* Foerster, 1869

***Rhorus longicornis* (Holmgren, 1858)**

Material examined: Mazandaran province, Qaemshahr, Sarokola, 1♀, 12 May 2015.

General distribution: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Finland, France, Georgia, Germany, Greece, Hungary, Ireland, Kazakhstan, Latvia, Moldova, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Spain, Sweden, Switzerland, Türkiye, Ukraine, United Kingdom (Yu et al., 2016), Iran (new record).

Host records: Unknown.

Genus *Scopesis* Foerster, 1869

***Scopesis frontator* (Thunberg, 1822)**

Material examined: Guilan province, Lahijan, Narenjkelayeh, 1♂, September 2014.

General distribution: Austria, Belarus, Belgium, Czech Republic, Estonia, Finland, France, Germany, Hungary, Ireland, Latvia, Netherlands, Norway, Poland, Romania, Russia, Sweden, Switzerland, Ukraine, United Kingdom (Yu et al., 2016), Bulgaria, Türkiye (Riedel, Florez & Schmidt, 2024), Iran (new record).

Host records: Summarized by Yu et al. (2016) as being a parasitoid of the following tenthredinids: *Cladius pectinicornis* (Geoffroy), *Macrophya duodecimpunctata* (Linnaeus), and *Tenthredopsis tarsata* (Fabricius), as well as the noctuid *Xestia collina* (Boisduval) which is most probably a doubtful host record.

Subfamily Metopiinae Foerster, 1869

Genus *Exochus* Gravenhorst, 1829

Exochus gravis Gravenhorst, 1829

Material examined: West Azarbaijan province, Chaldoran, Aqdash, 2♀, 26 July 2012.

General distribution: Austria, Bulgaria, Denmark, France, Germany, Greece, Hungary, Lithuania, Netherlands, Poland, Romania, Russia, Spain, Türkiye, Ukraine, United Kingdom (Yu et al., 2016), Czech Republic (Holý & Zeman, 2018), Iran (new record), Georgia (Riedel et al., 2023), Switzerland (Klopfstein et al., 2019b).

Host records: Unknown.

Subfamily Orthocentrinae Foerster, 1869

Genus *Megastylus* Schiødte, 1838

Megastylus (Dicolus) pectoralis (Foerster, 1871)

Material examined: East Azarbaijan province, Khomarloo, near waterfall, 1♀, 1♂, September 2006.

General distribution: Armenia, Austria, Canada, Finland, France, Germany, Hungary, Lithuania, Mexico, Norway, Poland, Russia, United States of America, Ukraine, United Kingdom (Yu et al., 2016), Iran (new record), Switzerland (Klopfstein et al., 2019b).

Host records: Unknown.

Note: This is the first record of *Megastylus (Dicolus) pectoralis* for the Middle East.

Genus *Plectiscidea* Viereck, 1914

Plectiscidea (Plectiscidea) canaliculata (Foerster, 1871)

Material examined: Guilan province, Astara, Qarehsoo, 2♀, 19 May 2015.

General distribution: Austria, Azerbaijan, Czech Republic, Finland, France, Germany, Latvia, Lithuania, Montenegro, Netherlands, Norway, Poland, Russia, Serbia, Spain, Sweden, Ukraine, United Kingdom (Yu et al., 2016), Iran (new record), Georgia (Riedel et al., 2023), Switzerland (Klopfstein et al., 2019b).

Host records: The following hosts have been summarized by Yu et al. (2016) for *P. canaliculata*: *Allodia grata* (Meigen) (Diptera: Mycetophilidae), *Choristoneura murinana* (Hübner) (Lepidoptera: Tortricidae), and *Yponomeuta padella* (Linnaeus) (Lepidoptera: Yponomeutidae).

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Note: This is the first record of *Plectiscidea* (*Plectiscidea*) *canaliculata* for the Middle East.

***Plectiscidea* (*Fugatrix*) *communis* (Foerster, 1871)**

Material examined: East Azarbaijan province, Absh-Ahmad, near Imamzadeh Shah-Qasem, 1♀, 26 June 2010.

General distribution: Austria, Bulgaria, Canada, Czech Republic, Estonia, Finland, France, Germany, Iceland, Ireland, Italy, Kazakhstan, Lithuania, Montenegro, Norway, Poland, Romania, Russia, Serbia, United States of America, Ukraine, United Kingdom (Yu et al., 2016 as *Fugatrix communis*), Iran (new record), Slovakia (Holý & Zeman, 2018), Netherlands (Verheyde et al., 2021), Switzerland (Klopfstein et al., 2019b).

Host records: Unknown.

Note: This is the first record of *Plectiscidea* (*Fugatrix*) *communis* for the Middle East.

Subfamily Phygadeuontinae Foerster, 1869

Genus *Bathythrix* Foerster, 1869

***Bathythrix claviger* (Taschenberg, 1865)**

Material examined: Golestan province, Kordkoy, Gorji-Mahalleh, 1♀, 1♂, 10 May 2013; Mazandaran province, Behshahr, Zaghmarz, 1♂, July 2018.

General distribution: Austria, Bulgaria, Canada, Czech Republic, Finland, France, Germany, India, Ireland, Italy, Japan, Korea, Latvia, Netherlands, Norway, Poland, Russia, Spain, Sweden, Türkiye, United Kingdom, United States of America (Yu et al., 2016), Iran (new record), Slovakia (Holý & Zeman, 2018), Switzerland (Klopfstein et al., 2019b).

Host records: The following hosts have been summarized by Yu et al. (2016) for *B. claviger*: *Agelastica alni* (Linnaeus) (Coleoptera: Chrysomelidae), *Dendroctonus micans* (Kugelann) (Coleoptera: Curculionidae), *Diprion pini* (Linnaeus) (Hymenoptera: Diprionidae), and *Allantus cinctus* (Linnaeus), *Ametastegia glabrata* (Fallén), and *Strongylogaster* sp. (Hymenoptera: Tenthredinidae). Kolarov (1995) has also reported *Phymatodes alni* (Linnaeus) (Coleoptera: Cerambycidae) as a host for this species.

Genus *Helcostizus* Foerster, 1869

***Helcostizus restaurator* (Fabricius, 1775)**

Material examined: East Azarbaijan province, Arasbaran forest, 2♂, September 2014.

General distribution: Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Moldova, Norway, Poland, Russia, Spain, Sweden, Switzerland, Türkiye, Ukraine, United Kingdom, United States of America (Yu et al., 2016), Iran (new record), Netherlands (Verheyde et al., 2021), Slovakia (Holý & Zeman, 2018).

Host records: The following coleopteran species are summarized by Yu et al. (2016) as hosts for *H. restaurator*: *Callidium aeneum* (De Geer), *Cerambyx scopolii* Fuessly, *Dicentrus blunthneri* Le Conte, *Dorcadion pedestre* (Poda), *Molorchus minor* (Linnaeus), *Phymatodes* spp., *Poecilium glabratum* (Charpentier), *Ropalopus clavipes* (Fabricius), and *Saperda populnea* (Linnaeus) (Cerambycidae), *Hylesinus oleiperda* (Fabricius), and *Pissodes harcyniae* (Herbst) (Curculionidae).

Subfamily Tryphoninae Shuckard, 1840

Genus *Cosmoconus* Foerster, 1869

Cosmoconus meridionator Aubert, 1963

Material examined: Ardabil province, Aslanduz, Palangloo, 1♂, 14 June 2015.

General distribution: Armenia, Belarus, Bulgaria, China, Finland, France, Georgia, Germany, Latvia, Lithuania, Mongolia, Norway, Poland, Russia, Sweden, Switzerland, Türkiye, United Kingdom, Ukraine (Yu et al., 2016), Czech Republic (Holý & Zeman, 2018), Iran (new record).

Host records: Unknown.

Genus *Eridolius* Foerster, 1869

Eridolius gnathoxanthus (Gravenhorst, 1829)

Material examined: Golestan province, Gorgan, Ahangar-Mahalleh, 1♂, 1♀, 9 April 2012.

General distribution: Austria, Belarus, Belgium, Bulgaria, Canada, Denmark, Finland, France, Georgia, Germany, Hungary, Ireland, Italy, Lithuania, Mongolia, Netherlands, Norway, Poland, Romania, Russia, Sweden, Switzerland, United States of America, Ukraine, United Kingdom (Yu et al., 2016), Czech Republic (Holý & Zeman, 2018), Iran (new record).

Host records: Recorded by Hedwig (1962) as a parasitoid of the sesiid *Synanthedon tipuliformis* (Clerck).

Genus *Smicroplectrus* Thomson, 1883

Smicroplectrus quinquecinctus (Gravenhorst, 1820)

Material examined: West Azarbaijan province, Khoy, Qarehghosh, 3♀, 11 July 2012.

General distribution: Austria, Belarus, Belgium, Bulgaria, Finland, France, Germany, Ireland, Italy, Mongolia, Netherlands, Poland, Romania, Russia, Spain, Sweden, Switzerland, United Kingdom (Yu et al., 2016), Czech Republic, Slovakia (Holý & Zeman, 2018), Iran (new record).

Host records: Fulmek (1968) reported *Monophadnoides rubi* (Harris) (as *M. geniculatus*) (Hymenoptera: Tenthredinidae) as a host for *S. quinquecinctus*. *Nematus lucidus* (Panzer) (Hymenoptera: Tenthredinidae) was also reported as another host for *S. quinquecinctus* (Zwakhals and Blommers, 2022).

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Comments: Yu et al. (2016) listed South Korea as a distributional region for *S. quinquecinctus* but Kasparyan, Balueva, Lee, & Kang (2017) excluded it from the fauna of the country.

Note: This is the first record of *Smicroplectrus quinquecinctus* for the Middle East.

DISCUSSION

Based on the results of this faunistic research, 18 new species records of Ichneumonidae are added to the fauna of Iran, of which six species are recorded for the first time for the fauna of the Middle East: *Dusona polita*, *Eridolius gnathoxanthus*, *Megastylus (Dicolus) pectoralis*, *Plectiscidea (Plectiscidea) canaliculata*, *Plectiscidea (Fugatrix) communis* and *Smicroplectrus quinquecinctus*. Several contributions on Iranian ichneumonids during recent years indicate that the family Ichneumonidae is one of the hymenopteran families which are studied rather well in this country (see Yu et al., 2016; Karimi et al., 2023). Additionally, reports of new country records in most papers which are gradually published prove that there is still a long way to go to complete the species diversity of this family in Iran, as well as in other countries of the Middle East. However, with attention to the extent of Iran with 31 provinces incorporate diverse ecosystems, it is expected that several new records and new species of these efficient parasitoids will be collected through extensive samplings in all regions of Iran, especially the areas where have not been sampled systematically so far. Faunistic studies are the basis of entomological research, and on the other hand valid identification of the pests and their natural enemies are the first and most important step in progress of biological control programs and integrated pest management (IPM). Although Malaise traps are generally considered to be the best means of obtaining large, general samples of Ichneumonidae from most habitats (Fitton, Shaw & Gauld, 1988), this method does not allow the determination of parasitoid-host relationships. Therefore, the collecting and raising ichneumonids' hosts larvae and pupae of Lepidoptera and Coleoptera from various ecosystems will be necessary.

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