NEW RECORDS OF BRACONIDAE (HYMENOPTERA: ICHNEUMONOIDEA) FROM IRAN, AND IN MEMORIAM DR. MAXIMILIAN FISCHER (7 JUNE 1929 – 15 JUNE 2019)

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New records of Braconidae (Hymenoptera: Ichneumonoidea) from Iran, and in memoriam Dr. Maximilian Fischer (7 June 1929 – 15 June 2019). – Ghahari H., Beyarslan A., Kavallieratos N.G. – Braconids include important parasitoids of noxious insects in agricultural and natural ecosystems. In the current study, we present a total of 14 species of Braconidae as new records of the fauna of Iran belonging to six subfamilies: Alysiinae (three species in two genera), Aphidiinae (two species in one genus), Brachistinae (two species in two genera), Braconinae (two species in two genera), Cheloninae (four species in three genera), and Doryctinae (one species).

Key words: Braconidae, fauna, species diversity, parasitoid, Iran.

Introduction

Braconid wasps (Hymenoptera: Braconidae) include more than 21,220 species that belong to more than 1100 genera worldwide (Yu et al. 2016). They are primary parasitoids of insects (associated with more than 120 families) at their larval or adult stage. (Chen, van Achterberg 2019). These parasitoids may play efficient role as biological control agents of agricultural and forest pests (Shaw, Huddleston 1991; Wharton 1993; Shaw 2006; Quicke 2015).

The fauna of Iranian Braconidae has been relatively well studied, so that all subfamilies have been identified (e.g., Gadallah, Ghahari 2013a; 2013b; 2015; 2016; 2017; Barahoei et al. 2014; Gadallah et al. 2015a; 2015b; 2016a; 2016b; Ghahari 2016; Beyarslan et al. 2017) and numerous species checklists have been also updated several times.
The objective of the present study was to introduce a total of 14 species of Braconidae species as new records for the fauna of Iran.

Material and methods
In this faunistic survey, some of the specimens have been collected by Malaise traps and some of them were obtained by rearing host species in incubators set at 25±2 °C, 65±5% RH and 14:10 L:D. The collected specimens were killed with ethyl acetate, mounted on triangular labels and examined with an Olympus SZ61 Stereo microscope. Identifications of all the specimens were confirmed by the authorized braconologists. Nomenclature and classification of the present study suggested by Yu et al. (2016), and Chen and van Achterberg (2019) have been followed.

Results
List of species: in this faunistic paper, totally 14 species within six subfamilies were collected and identified as new records for the fauna of Iran.

Subfamily Alysiinae Leach, 1815
Genus Chorebus Haliday, 1833
Chorebus (Stiphrocer a) albipes (Haliday, 1839)
Material examined: Guilan province: Siahkal (Ziaratgah), 2 ♀♀, 1♂, 3.viii.2014, ex Aulagromyza populi (Kaltenbach, 1864) (Diptera: Agromyzidae).

Chorebus (Phaenolexis) brevicornis (Thomson, 1895)
Material examined: West Azarbaijan province, Khoy (Qareghosh), 3 ♀♀, 11.viii.2012, ex Melanagromyza aeneoventris (Fallén, 1823) (Diptera: Agromyzidae).

Genus Dacnusa Haliday, 1833
Dacnusa (Dacnusa) faeroensis (Roman, 1917)
Material examined: Guilan province, Langrud (Talesh-Mahalleh), 1♀, 16.iv.2009.

Subfamily Aphidiinae Haliday, 1833
Genus Aphidius Nees von Esenbeck, 1819
Aphidius (Aphidius) hortensis Marshall, 1896
Material examined: Golestan province, Kordkoy (Gorji-Mahalleh), 3♀♂, 2♂♂, 10.v.2013, ex an unknown aphid species (Hemiptera: Aphididae) around wheat fields.

Aphidius (Aphidius) sonchi Marshall, 1896
Material examined: Khuzestan province, Andimeshk, 3♂♂, 6♀♀, 14.vii.2014, ex Hyperomyzus lactucae (Linnaeus, 1758) (Hemiptera: Aphididae) on Lactuca sativa L. (Asteraceae).

Subfamily Brachistinae Foerster, 1863
Genus Blacus Nees, 1818
Blacus (Blacus) instabilis Ruthe, 1861
Material examined: Golestan province, Bandar-Torkman (Chapagghi), 2♀♂, 9.v.2012.

Genus Eubazus Nees, 1812
Eubazus (Brachistes) parvulus (Reinhard, 1867)
Material examined: Kordistan province, Bijar (Chashmeh Adineh), 1♀, 1♂, 3.iv.2013.

Genus Coeloides Wesmael, 1838
Coeloides filiformis Ratzeburg, 1852
Material examined: Fars province, Abadeh (Yaghub-Abad), 2♀♂, 6.iv.2015.

Subfamily Cheloninae Foerster, 1863
Genus Chelonus Panzer 1806
Chelonus (Chelonus) caradrinae Kokujev, 1914
Material examined: West Azarbaijan province, Oshnavieh (Sufian), 3♀♂, 14.v.2010, ex Spodoptera exigua (Hübner, 1808) (Lepidoptera: Noctuidae).

Chelonus (Microchelonus) exilis Marshall, 1885
Material examined: Mazandaran province, Qaemshahr (Kootena), 1♀, 12.v.2015.

Chelonus (Microchelonus) vescus (Kokuyev, 1899)
Material examined: Guilan province, Langrood (Golsefid), 2♀♂, 1♂, 18.vi.2009.

Genus Phanerotoma Wesmael, 1838
Phanerotoma (Phanerotoma) planifrons (Nees, 1816)
Material examined: Markazi province, Khomein, 3♀♂, 25.vi.2014, ex Grapholita funebrana (Treitschke, 1835) (Lepidoptera: Tortricidae).

Subfamily Doryctinae Foerster, 1863
Genus Monolexis Foerster, 1862
Monolexis fuscicornis Foerster, 1863
Material examined: West Azarbaijan province, Maku (Mirza-Khalil), 2♀♂, 10.vii.2012, ex Lycius linearis (Goeze, 1777) (Coleoptera: Bostrichidae).
Discussion
Our findings revealed that 14 species are new Iranian records. Considering the fact that 983 braconid species have been recorded from Iran (see Samin et al. 2018b; Gadallah et al. 2018; Gahhari, Beyarslan 2019; Gahhari, Gadallah 2019; Gahhari et al. 2019), the total number reached now 997 identified species. Among 30 subfamilies that are known from Iran, Braconinae is most diverse since it includes 163 recorded species (Fig. 1).

![Species diversity of Iranian Braconidae by subfamilies](image)

Due to fact that Iran is a large country which comprises variable ecosystems, more faunistic surveys in different regions (especially central and eastern parts) are expected to shed light on the actual number of Braconidae and further enhancing their host spectrum. The knowledge of parasitoids and their hosts is important at a country level since it may resolve targeted biological control efforts against noxious species.

In Memoriam Dr. Maximilian Fischer (7 June 1929 – 15 June 2019)
Dr. Maximilian Fischer was born on 7 June 1929 in Vienna, Austria.

He studied science and philosophy at the University of Vienna from 1947 until 1953. He took zoology as the main subject and botany as a subsidiary subject and also underwent the courses for teaching Natural History and Philosophy at secondary schools. He passed the examination for the latter, successfully completed his doctoral thesis, and finished his academic education as Doctor of Philosophy in July 1953.

Dr. Fischer was an outstanding specialist on the family Braconidae (Hymenoptera). During his nearly 70 years of research activity, he identified a large number of braconid specimens from all zoogeographical regions, described over 2,000 species new to science, and published about 400 scientific papers (Gusenleitner 2019). Owing to these huge taxonomic accomplishments he became one of the most famous braconologists of the world.
I (H. Ghahari) had numerous contacts with Max. We started cooperating on Iranian Braconidae in 2007 (see below for his first two emails: Figs. 1, 2). Max was unselfish in identifying many of my specimens of Braconidae from Iran. He received several parcels from me (Figs. 3, 4), and, in spite of being very busy with his own scientific projects, he was always ready for fast identification, as well as editing our manuscripts. It is my honor that we have co-authored 22 papers on Iranian Braconidae (see Appendix 1).

Dr. Maximilian Fischer passed away on 15 June 2019 in Vienna.

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Fig. 1. The first communication of M. Fischer to H. Ghahari (4 October 2007).
Fig. 2. The second communication of M. Fischer to H. Ghahari (15 November 2007).

Re: Braconidae

Thursday, November 11, 2010 5:27 PM
From: "Dr. Maximilian Fischer" <maximilian.fischer@chello.at>
Add sender to Contacts
To: "Hassan Ghahari" <hghahhari@yahoo.com>

Dear Hassan,
I think that one parcel has arrived. Next week I will see in my office what arrived. Then I will inform you.
I wish you all the best!

Sincerely yours,
Max

Fig. 3. Communication of H. Ghahari and M. Fischer about the identification of Iranian Braconidae (November 11, 2010).

Re: Fw: pdf Linzer biologische Beiträge

Tuesday, January 25, 2011 5:51 PM
From: "Dr. Maximilian Fischer" <maximilian.fischer@chello.at>
Add sender to Contacts
To: "Hassan Ghahari" <hghahhari@yahoo.com>

Dear Hassan,
I return to you the braconids sent to me by Dr. Schwarz and Dr. Jussila. The greatest part of this material belong to the Aphidiidae. I have seen only one specimen which is either a Chorebus or Dacnusa (eventually a related genus, but I think rather no) (Alysiinae, Dacnusini). Very few specimens belong to other groups.
I hope that you are on good health, and I wish you all the best for the future.
Best regards,
Max

Fig. 4. Communication of H. Ghahari and M. Fischer about the identification of Iranian Braconidae (January 25, 2011).
Papers dedicated to Dr. M. Fisher:
Fischer, M. (2004) From my entomological life. *Proceedings of the Russian Entomological Society*, 75(1): 73–81.

Gusenleitner, F. (2019) Maximilian Fischer (*7. Juni 1929, †15. Juni 2019): Ein Leben für das Naturhistorische Museum Wien und für die Wissenschaft. *Linzer biologische Beiträge*, 51(2): 1211–1300.

Gusenleitner F., Zettel, H. (2019) Auf den Spuren der Grabwespen - Herrn Mag. Dr. Hermann Dollfuß zum 80. Geburtstag. *AÖE News*, 1: 6–15.

Lödl, M. (2020) Hofrat Univ.-Doz. Mag. Dr. Maximilian Fischer (1929-2019). *Annalen des Naturhistorischen Museums in Wien*, Serie B, 122: 5–9.

Schönmann, H. (1994) Hofrat Univ.-Doz. Mag. Dr. Maximilian Fischer zum 65. Geburtstag. *Annalen des Naturhistorischen Museums in Wien*, Serie B, 96: 1–18.

Zettel, H. (2020) Hofrat Univ.-Doz. Mag. Dr. Maximilian Fischer (1929–2019) - eine persönliche Hommage. *AÖE News*, 1: 89–93.

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Appendix 1: Co-papers of H. Ghahari with M. Fischer

GHAHARI, H., BEYARSLAN, A. (2019) A faunistic study on Braconidae (Hymenoptera: Ichneumonoidea) from Iran, and in Memoriam Dr. Jenő Papp (20 May 1933 – 11 December 2017). Acta Biologica Turcica, 32(4): 248–254.

GHAHARI, H., GADALLAH, N.S. (2019) New records of Braconid wasps (Hymenoptera: Ichneumoidea: Braconidae) from Iran. Entomological News, 128(4): 384–392.

GHAHARI, H., FISCHER, M., BEYARSLAN, A., NAVAEIAN, M., HOSSEINI BOLDAJI, S.A. (2019) New records of Brachistinae, Braconinae, Cheloninae and Microgastrinae (Hymenoptera: Braconidae) from Iran. Wayi Science Journal, 35(2): 135–141.

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SADMIN, N., CORONADO-BLANCO, J.M., FISCHER, M., VAN ACHTERBERG, C., SAKENIN, H., DAVIDIAN, E. (2018b) Updated checklist of Iranian Braconidae (Hymenoptera: Ichneumoidea) with twenty-three new records. Natura Somogyiensis, 32: 21–36.

SHAW, M.R., HUDDLESTON, T. (1991) Classification and biology of Braconid wasps (Hymenoptera: Braconidae). Handbooks for the identification of British insects. Royal Entomological Society of London, 7(11): 1–126.

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GHAHARI H., FISCHER, M. (2012) A faunistic survey on the braconid wasps (Hymenoptera: Braconidae) from Kermanshah province, Iran. *Entomofauna*, 33: 305–312.

GHAHARI H., FISCHER, M., TOBIAS, V. (2012) A study on the Braconidae (Hymenoptera: Ichneumonoidea) from Guilan province, Iran. *Entomofauna*, 33: 317–324.

GHAHARI H., FISCHER, M., PAPP, J., TOBIAS, V. (2012) A contribution to the knowledge of braconids (Hymenoptera: Braconidae) from Lorestan province Iran. *Entomofauna*, 33(7): 65–72.

GHAHARI, H., FISCHER, M., JUSSILA, R. (2012) Braconid and ichneumonid wasps (Hymenoptera, Ichneumonoidea) as the parasitoids of *Plutella xylostella* (L.) (Lepidoptera: Plutellidae) in Iran. *Entomofauna*, 33: 281–288.

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