



<http://dx.doi.org/10.11646/zootaxa.3784.2.3>

<http://zoobank.org/urn:lsid:zoobank.org:pub:2D099A7F-38E1-4D67-AEA5-30551C67A02D>

Contributions to the Opiinae (Hymenoptera: Braconidae) of Eastern Iran with updated checklist of Iranian species

NAHID KHAJEH¹, EHSAN RAKHSHANI^{1,4}, FRANCISCO JAVIER PERIS-FELIPO² & VLADIMIR ŽIKIĆ³

¹Department of Plant Protection, College of Agriculture, University of Zabol, Zabol, P.O. Box: 98615-538, I. R. Iran.

E-mail: rakhshani@uoz.ac.ir

²Laboratory of Entomology and Pest Control, Institute Cavanilles of Biodiversity and Evolutionary Biology, University of Valencia, c/ Catedrático José Beltrán n 2, 46980 Paterna, Valencia, Spain. E-mail: Francisco.peris@uv.es

³Faculty of Sciences, Department of Biology and Ecology, University of Niš, ul. Višegradska 33, 18000 Niš, Serbia.

E-mail: vzikic@yahoo.com

⁴Corresponding author. E-mail: rakhshani@uoz.ac.ir

Abstract

The present work collects the checklist of species of Opiinae (Hymenoptera: Braconidae) from Iran and presents new information about the specimens captured in the Sistan and Baluchestan province during 2009–2011. A total of 68 species belonging to eight genera have been listed, of which nine species including *Opius* (*Hypocynodus*) *arundinis* Fischer, 1964a; *Opius* (*Hypocynodus*) *bouceki* (Fischer, 1958b); *Opius* (*Opius*) *caricivorae* Fischer, 1964b; *Opius* (*Opius*) *exilis* Haliday, 1837; *Opius* (*Opiothorax*) *opacus* Fischer, 1968; *Opius* (*Allophlebus*) *tabificus* Papp, 1979; *Phaedrotoma biroica* (Fischer et Beyarslan 2005a); *Phaedrotoma mirabunda* (Papp, 1982) and *Xynobius rudis* (Wesmaelm, 1835) are new records from Iran.

Key words: Braconidae, Opiinae, checklist, new records, Sistan

Introduction

The Braconidae are major regulators of phytophagous insect populations (LaSalle & Gauld 1992) and they are the second largest family within the Hymenoptera. The majority of braconid species are primary parasitoids of the immature stages of Lepidoptera, Coleoptera and Diptera (Shaw & Huddleston 1991). Within the braconids, the subfamily Opiinae is one of the largest subfamilies containing 1,968 described species known in the world fauna (Yu *et al.* 2012). Fischer (1972a) initially recognized 23 genera (excluding Gnamptodontinae) but, nowadays the number of valid genera varies from 17 (Wharton 1997b) to 24 (Fischer 1987), although some authors distinguish 35 genera (Achterberg & Maeto 1990; Achterberg & Salvo 1997; Achterberg 1997, 2004a, 2004b). The species of the subfamily Opiinae are an assemblage of small parasitic wasps strictly koinobiont parasitoids of Cyclorrhaphous Diptera (Wharton 1997b), mainly of leaf miners and other larvae living in fruits. The hosts are known for only around 300 species, mostly within Agromyzidae, Anthomyiidae, Drosophilidae, Ephydriidae, Psilidae, Scatophagidae and Tephritidae (Fischer 1971a, 1971b, 1972a, 1977, 1987; Shaw & Huddleston 1991). *Opius* Wesmael, 1835 and *Phaedrotoma* Foerster, 1862 are the largest genera, and more than half of the recorded hosts belong to the Agromyzidae (Shaw & Huddleston 1991), which are considered as pests of economic importance (Capinera 2001). Several species of the subfamily Opiinae are considered as important biocontrol agents of leaf mining Agromyzidae and fruit-infesting Tephritidae (Fischer 1971b; Greathead 1975; Wharton 1984, 1997a; Neuenschwander *et al.* 1987; Schuster & Wharton 1993; Salvo & Valladares 1995). On the other hand, Opiinae is closely related to Alysiniinae, based on the morphological data and the type of parasitism on cyclorrhaphous Diptera (Wharton 1988; Quicke & Achterberg 1990) and also molecular analyses (Dowton *et al.* 1998).

Opius is the largest genus in Opiinae with over 1,000 species, which has been segregated into 34 subgenera

References

- Achterberg, Van C. & Maeto, K. (1990) Two new and aberrant species of Braconidae (Hymenoptera) from Japan. *Zoologische Mededelingen Leiden*, 64, 59–70.
- Achterberg, Van C. & Salvo, A. (1997) Reared Opiinae (Hymenoptera: Braconidae) from Argentina. *Zoologische Mededelingen Leiden*, 71, 189–214.
- Achterberg, Van C. (1997) Revision of the Haliday collection of Braconidae (Hymenoptera). *Zoologische Verhandelingen Leiden*, 314, 1–115.
- Achterberg, Van C. (2004a) New Indo-Australian subgenera and species of the genera *Xynobius* Foerster and *Ademoneuron* Fischer (Hymenoptera: Braconidae: Opiinae). *Zoologische Mededelingen*, 78, 313–329.
- Achterberg, Van C. (2004b) *Bitomoides* gen. nov. (Hymenoptera: Braconidae: Opiinae) from Europe. *Zoologische Mededelingen*, 78, 331–335.
- Beyarslan, A. & Fischer, M. (2011) Contributions to the Opiinae fauna of Turkey (Hymenoptera: Braconidae). *Turkish Journal of Zoology*, 35 (3), 29–305.
- Beyarslan, A. & Fischer, M. (2013) Checklist of Turkish Opiinae (Hymenoptera, Braconidae). *Zootaxa*, 3721 (5), 401–454. <http://dx.doi.org/10.11646/zootaxa.3721.5.1>
- Capinera, J.L. (2001) *Handbook of Vegetable Pests*. Academic Press, New York, 729 pp.
- Dowton, M., Austin, A.D. & Antolin, M.F. (1998) Evolutionary relationships among the Braconidae (Hymenoptera: Ichneumonoidea) inferred from partial 16S rDNA gene sequences. *Insect Molecular Biology*, 7 (2), 129–150. <http://dx.doi.org/10.1046/j.1365-2583.1998.72058.x>
- Fallahzadeh, M. & Saghaei, N. (2010) Checklist of Braconidae (Insecta: Hymenoptera) from Iran. *Munis Entomology & Zoology*, 5, 170–186.
- Farrar, N. & Chou, L.Y. (2000) Introduction of *Fopius carpomyiae* (Silvestri, 1916) (Braconidae: Opiinae), as a parasitoid of Ber fruitfly larvae *Carpomya vesuviana* Costa (Tephritidae), in Iran. *Applied Entomology & Phytopathology*, 67 (1–2), 100–101.
- Farrar, N., Golestaneh, R., Askari, H. & Assareh, M.H. (2009) Studies on parasitism of *Fopius carpomyie* (Silvestri) (Hymenoptera: Braconidae), an egg-pupal parasitoid of Ber (Konar) fruit fly, *Carpomya vesuviana* Costa (Diptera: Tephritidae), in Bushehr—Iran. *Acta Horticulturae*, 840, 431–438.
- Fischer, M. & Beyarslan, A. (2005a) New maggot wasps from the Turkish fauna (Hymenoptera, Braconidae, Opiinae). *Polskie Pismo Entomologiczne*, 74, 379–421.
- Fischer, M. & Beyarslan, A. (2005b) A survey of Opiinae (Hymenoptera, Braconidae) of Turkey. *Fragmenta Faunistica*, 48, 27–62.
- Fischer, M. (1958a) Die europäischen Arten der Gattung *Opius* Wesm. Teil IIb (Hymenoptera, Braconidae). *Annales Musei Nationalis Hungarici*, 50, 241–260.
- Fischer, M. (1958b) Die europäischen Arten der Gattung *Opius* Wesm. Teil IVb (Hymenoptera, Braconidae). *Acta Entomologica Musei Nationalis Pragae*, 32, 295–316.
- Fischer, M. (1958c) Neue Braconiden aus dem Zoologischen Museum Berlin, Sammlung Forster. *Mitteilungen aus dem Zoologischen Museum in Berlin*, 34, 173–182. <http://dx.doi.org/10.1002/mmzn.4830340109>
- Fischer, M. (1958d) Die europäischen Arten der Gattung *Opius* Wesm. Teil Ib (Hymenoptera, Braconidae). *Annali del Museo Civico di Storia Naturale di Genova*, 70, 245–304.
- Fischer, M. (1959a) Neue *Opius*-Arten aus Polen (Hymenoptera, Braconidae). *Annales Zoologici*, 18, 81–87.
- Fischer, M. (1959b) Ein neuer Beitrag zur Kenntnis der palaarktischen *Opius* Wesm.-Arten (Hymenoptera, Braconidae). *Polskie Pismo Entomologiczne*, 29, 17–34.
- Fischer, M. (1959c) Die europäischen Arten der Gattung *Opius* Wesm. Teil IIc. (Hymenoptera, Braconidae). *Opuscula Entomologica*, 24, 55–78.
- Fischer, M. (1959d) Die europäischen Opiinae (Hymenoptera, Braconidae). *Acta Entomologica Musei Nationalis Pragae*, 33, 241–263.
- Fischer, M. (1960) Die europäischen Arten der Gattung *Opius* Wesm., Teil IVa. *Annales Zoologici Warszawa*, 19, 33–112.
- Fischer, M. (1962) Neues über die palaarktische *Opius*-Fauna (Hymenoptera, Braconidae). *Polskie Pismo Entomologiczne*, 32, 89–107.
- Fischer, M. (1963) Eine neue *Pectenopus*-Art aus dem Iran (Hymenoptera, Braconidae, Opiinae). *Stuttgarter Beiträge zur Naturkunde*, 98, 1–3.
- Fischer, M. (1964a) Über Opiinae (Hymenoptera, Braconidae) der westlichen Palaarktis. *Annalen des Naturhistorischen Museums in Wien*, 67, 409–433.
- Fischer, M. (1964b) Die gezüchteten Opiinae der Sammlung Groschke (Hymenoptera, Braconidae). *Stuttgarter Beiträge zur Naturkunde*, 136, 1–12.
- Fischer, M. (1968) 141. Opiinae. Ergebnisse der zoologischen Forschungen von Dr. Z. Kaszab in der Mongolei (Hymenoptera, Braconidae). *Reichenbachia*, 11, 97–114.
- Fischer, M. (1971a) Hym. Braconidae, World Opiinae, In: Delucchi, V. & Remaudière, G. (Eds.), *Index of Entomophagous Insects* 5. Le François, Paris, pp. 1–189.

- Fischer, M. (1971b) Two *Opius* species imported from Uganda into Hawaii (Hymenoptera, Braconidae). *Anzeiger für Schadlingskunde und Pflanzenschutz*, 44, 10–12.
- Fischer, M. (1972a) *Hymenoptera, Braconidae (Opiinae I)*. Das Tierreich, 91, 1–620.
- Fischer, M. (1972b) Über die athiopischen *Opius*-Arten der Sektionen C und D. *Redia*, 53, 1–66.
- Fischer, M. (1977) *Hymenoptera: Braconidae (Opiinae II-Amerika)*. Das Tierreich, 96, 1–1001.
- Fischer, M. (1987) *Hymenoptera Opiinae III—äthiopische, orientalische, australische und ozeanische Region*. Das Tierreich, 104, 1–734.
- Fischer, M. (1990) Paläarktische Opiinae (Hymenoptera, Braconidae): Neue Arten und neue Funde aus dem Ungarischen Naturwissenschaftlichen Museum in Budapest. *Annales Historico-Naturales Musei Nationalis Hungarici*, 81 (1989), 205–238.
- Fischer, M. (1999) Zur Evolution und zum System der *Opius*-verwandten Gattungen der Unterfamilie Opiinae mit einer erweiterten Aufteilung dieses Gattungs-Komplexes (Hymenoptera, Braconidae, Opiinae). *Linzer Biologische Beiträge*, 31 (1), 277–336.
- Fischer, M. (2001) Mitteilungen über neue und schon bekannte *Opius* Wesmael-Arten der Alten Welt (Hymenoptera, Braconidae, Opiinae). *Linzer Biologische Beiträge*, 33 (1), 5–33.
- Förster, A. (1862) Synopsis der Familien und Gattungen der Braconiden. *Verhandlungen des Naturhistorischen Vereins der Preussischen Rheinlande und Westfalens*, 19, 225–288.
- Ghahari, H. & Fischer, A. (2011) A study on the Braconidae (Hymenoptera: Ichneumonoidea) from some regions of northern Iran. *Entomofauna*, 32 (8), 181–193.
- Ghahari, H., Fischer, M., Erdogan, O.C., Beyarslan, A. & Havaskary, M. (2009) A contribution to the knowledge of the Braconid-Fauna (Hymenoptera, Ichneumonoidea, Braconidae) of Arasbaran, northwestern Iran. *Entomofauna*, 30 (20), 329–336.
- Ghahari, H., Fischer, M., Hedqvist, K.J., Erdogan, O.C., Achterberg, Van C. & Beyarslan, A. (2010) Some new records of Braconidae (Hymenoptera) for Iran. *Linzer Biologische Beiträge*, 42 (2), 1395–1404.
- Ghahari, H., Fischer, M. & Papp, J. (2011a) A study on the braconid wasps (Hymenoptera: Braconidae) from Isfahan province, Iran. *Entomofauna*, 32 (16), 261–270.
- Ghahari, H., Fischer, M., Sakenin, H. & Imani, S. (2011b) A contribution to the Agathidinae, Alysiinae, Aphidiinae, Braconinae, Microgastrinae and Opiinae (Hymenoptera: Braconidae) from cotton fields and surrounding grasslands of Iran. *Linzer Biologische Beiträge*, 43 (2), 1269–1276.
- Ghahari, H., Fischer, M., Papp, J. & Tobias, V.I. (2012a) A contribution to the knowledge of Braconidae) from Lorestan province, Iran. *Entomofauna*, 7, 65–72.
- Ghahari, H., Fischer, M. & Tobias, V.I. (2012b) A study on the Braconidae (Hymenoptera: Ichneumonidae) from Guilan province, Iran. *Entomofauna*, 22, 317–324.
- Greathead, D.J. (1975) Biological control of the beanfly, *Ophiomyia phaseoli* (Dipt. Agromyzidae), by *Opius* spp. (Hym. Braconidae) in the Hawaiian Islands. *Entomophaga*, 20, 313–316.
<http://dx.doi.org/10.1007/bf02371957>
- Haliday, A.H. (1837) Essay on parasitic Hymenoptera. *Entomological Magazine*, 4 (3), 203–221.
- Jabbary, M., Shahriari, A.R. & Zolfaghari, F. (2013) Evaluation of flora and life forms and chorology of plant species in Sistan region, Iran. *Advanced Crop Science*, 3 (4), 273–279.
- Jahantigh, M. & Efe, R. (2010) Effect of waste water irrigation on phytosociological characteristics of the vegetation: a case study in Sistan Region. *American-Eurasian Journal of Agricultural & Environmental Science*, 7 (4), 406–414.
- LaSalle, J. & Gauld, I.D. (1993) *Hymenoptera and Biodiversity*. CAB International, Wallingford, Oxon, UK, 348 pp.
- Lashkari Bod, A., Rakhshani, E., Talebi, A.A., Lozan, A. & Zikic, V. (2011) Contribution to the knowledge of Braconidae (Hym., Ichneumonoidea) of Iran. *Biharean Biologist*, 5 (2), 147–150.
- Li, X.Y., Achterberg, Van C. & Tan, J.C. (2013) Revision of the subfamily Opiinae (Hymenoptera, Braconidae) from Hunan (China), including thirty-six new species and two new genera. *ZooKeys*, 268, 1–168.
<http://dx.doi.org/10.3897/zookeys.268.4071>
- Nees von Esenbeck, C.G. (1834) *Hymenopterorum Ichneumonibus affinium monographiae, genera Europaea et species illustrantes*. 1. Stuttgartiae et Tubingae, 320 pp.
<http://dx.doi.org/10.5962/bhl.title.26555>
- Neuenschwander, P., Murphy, S.P. & Coly, E.V. (1987) Introduction of exotic parasitic wasps for the control of *Liriomyza trifolii* (Dipt., Agromyzidae) in Senegal. *Tropical Pest Management*, 33, 290–297.
<http://dx.doi.org/10.1080/09670878709371173>
- Papp, J. (1979) Braconidae (Hymenoptera) from Tunisia, 1. *Folia Entomologica Hungarica*, 32 (2), 175–187.
- Papp, J. (1982) Braconidae (Hymenoptera) from Greece, 1. *Annales Musei Goulandris*, 5, 183–193.
- Quicke, D.L.J. & Achterberg, C. van. (1990) Phylogeny of the subfamilies of the family Braconidae (Hymenoptera: Ichneumonoidea). *Zoologische Verhandlungen*, 258, 1–95.
- Rastegar, J., Sakenin, H., Khodaparast, S. & Havaskary, M. (2012) On a collection of Braconidae (Hymenoptera) from East Azarbaijan and vicinity, Iran. *Calodema*, 226, 1–4.
- Salvo, A. & Valladares, G. (1995) Parasitic complex (Hymenoptera: Parasitica) of *Liriomyza huidobrensis* (Diptera: Agromyzidae) on broad beans. *Agriscientia*, 12, 39–47.

- Schuster, D.J. & Wharton, R.A. (1993) Hymenopterous parasitoids of leafmining *Liriomyza* spp. (Diptera: Agromyzidae) on tomato in Florida. *Environmental Entomology*, 22, 1188–1191.
- Shafie, H., Hosseini, S.M. & Amiri, I. (2012) RS-based assessment of vegetation cover changes in Sistan Plain. *International Journal of Forest, Soil and Erosion*, 2 (2), 97–100.
- Shaw, M.R. & Huddleston, T. (1991) *Classification and biology of braconid wasps (Hymenoptera: Braconidae)*. Handbooks for the Identification of British Insects, 7 (11), 1–26.
- Silvestri, F. (1916) Descrizione di alcuni Imenotteri Braconidi parassiti Ditteri Tripaneidi nell'India. *Bollettino del Laboratorio di Zoologia Generale e Agraria, Portici*, 11, 160–169.
- Stelfox, A.W. (1949) Descriptions of four new species belonging to the genus *Opius* (Hym., Braconidae). *Entomologist's Monthly Magazine*, 85, 306–308.
- Stelfox, A.W. (1959) A new species of *Opius* (Hym., Braconidae) from the sand dunes in Ireland. *Entomologist's Monthly Magazine*, 95, 118–119.
- Szépligeti, G. (1898) Beitrage zur Kenntnis der ungarischen Braconiden, 3. Theil. *Termesztrajzi Fuzetek*, 21, 381–396.
- Szépligeti, G. (1910) In: Marchal, P. (1910) Sur un Braconide (Hym.) nouveau, parasite du *Dacus oleae*. *Bulletin de la Societe Entomologique de France*, 13, 243–244.
- Telenga, N.A. (1950) [Neue Arten parasitischer Hymenopteren der Familie Braconidae in der UdSSR.] *Nauchni Trudy Instituta Entomologii i Fitopatologii Akademii Nauk Ukrainskoy*, 2, 293–308. [in Russian]
- Thomson, C.G. (1895) LII. Bidrag till Braconidernas Kannedom. *Opuscula Entomologica*, 20, 2141–2339.
- Tobias V.I. (1998) Opiinae. In: Ler, P.A. (Ed.), *Key to the insects of Russian Far East. Vol. IV. Neuropteroidea, Mecoptera, Hymenoptera part 3*. Dal'nauka, Vladivostok, pp. 558–655.
- Tobias, V.I., Jakimavicius, A. & Kiriyai, G. (1986) Opiinae. In: Medvedev, G.S. (Ed.), *Keys to the Insects of the European Part of the USSR, III. Part V*. Nauca Publisher, Leningrad., pp. 7–100. [in Russian, English translation in 1995]
- Wesmael, C. (1835) Monographie des Braconides de Belgique. *Nouveaux Memoires de l'Academie Royale des Sciences et Belles-lettres Bruxelles*, 9, 1–252.
- Wesmael, C. (1838) Monographie des Braconides de Belgique. 4. *Nouveaux Memoires de l'Academie Royale des Sciences et Belles-lettres de Bruxelles*, 11, 1–166.
- Walker, F. (1860) Characters of some apparently undescribed Ceylon insects. *Annals and Magazine of Natural History*, 5 (3), 304–311.
- Wharton, R.A. (1984) The status of certain Braconidae (Hymenoptera) cultured for biological control programs, and description of a new species of *Macrocentrus*. *Proceedings of the Entomological Society of Washington*, 86, 902–912.
- Wharton, R.A. (1987) Changes in nomenclature and classification of some opiine Braconidae (Hymenoptera). *Proceedings of the Entomological Society of Washington*, 89 (1), 61–73.
- Wharton, R.A. (1988) Classification of the braconid subfamily Opiinae (Hymenoptera). *The Canadian Entomologist*, 120, 333–360.
<http://dx.doi.org/10.4039/ent120333-4>
- Wharton, R.A. (1997a) Generic relationships of opiine Braconidae (Hymenoptera) parasitic on fruit-infesting Tephritidae (Diptera). *Contributions of the American Entomological Institute*, 30, 1–53.
- Wharton, R.A. (1997b) Subfamily Opiinae. In: Wharton, R.A., Marsh, P.M. & Sharkey, M.J. (Eds.), *Manual of the New World Genera of the Family Braconidae (Hymenoptera)*. International Society of Hymenopterists Special Publication No. 1., Washington, DC, U.S.A., pp. 378–395.
- Yu, D.S., Achterberg, C. van & Horstmann, K. (2012) *World Ichneumonoidea 2011. Taxonomy, biology, morphology and distribution (Braconidae)*. Vancouver. Taxapad (Scientific names for information management) Interactive catalogue on DVD/CDROM.