

First record of *Microplitis rufiventris* Kokujev, 1914 (Braconidae: Microgastrinae) from Iran

Samira Farahani¹, Ali Asghar Talebi^{1*}, Cornelis van Achterberg² and Ehsan Rakhshani³

¹ Department of Entomology, Faculty of Agriculture, Tarbiat Modares University, P. O. Box 14115-336, Tehran, Iran.

² Senior Researcher & Curator Hymenoptera, Department of Terrestrial Zoology, Netherlands Centre for Biodiversity Naturalis, Postbox 9517, 2300 RA Leiden, The Netherlands.

³ Department of Plant Protection, College of Agriculture, University of Zabol, P. O. Box 98615-538, Zabol, Iran.

* Corresponding author. E-mail: talebia@modares.ac.ir

ABSTRACT: Occurrence of the genus *Microplitis* Forster (Braconidae, Microgastrinae) was surveyed in the Northern part of Iran. The specimens were collected using Malaise traps during 2010–2011. Two species, *Microplitis rufiventris* Kokujev, 1914 and *M. ochraceus* Szepilgeti, 1896 were collected and identified of which the first species is newly recorded from Iran. Diagnostic characters and geographical distribution of the species are briefly discussed.

Microgastrinae Förster, 1862 is one of the largest subfamilies of Braconidae (Hymenoptera: Ichneumonoidea) (van Achterberg 1976). All species attack and develop in larval stage of insects especially Lepidoptera and Coleoptera and exit from the host to pupate (Shaw and Huddleston 1991). Microgastrinae comprises more than 2,197 described species worldwide (Yu *et al.* 2012). The tribe Microplitini Mason, 1981 included four genera, *i.e.*, *Alloplitis* Nixon, 1965, *Microplitis* Förster, 1862, *Philoplitis* Nixon, 1965 and *Snellenius* Westwood, 1882, of which only *Microplitis* is represented in the west Palaearctic region (Yu *et al.* 2012).

The genus *Microplitis* comprises a moderately small group, but the species have a worldwide distribution (Yu *et al.* 2012). This genus includes 178 described species worldwide, and approximately 77 species are found in the Palaearctic region (Yu *et al.* 2012). Member of the genus *Microplitis* are endoparasitoids of Lepidoptera, mainly Noctuidae (Wilkinson 1930; Yu *et al.* 2012; Gupta 2013). Janzen *et al.* (2003) studied the host specificity and hyperparasitism associated with *Microplitis* species in relation to sphingid hosts.

The genus *Microplitis* was formerly classified under the genus *Microgaster* Latreille, 1804 with the type species *Microgaster sordipes* Nees (Telenga 1955). Species of the genus *Microplitis* were transferred to the new genus *Glabromicroplitis* by Papp (1979, 1986). Nixon (1965) reclassified and reorganized the subfamily Microgastrinae. According to the subsequent studies, the genus *Glabromicroplitis* has been determined as a junior synonym of *Microplitis* (Austin and Dangerfield 1993). The genus can be recognized by the roughly sculptured propodeum, having a large areolet, shape and sculpture of the first metasomal tergite, and by the existence of a weak suture separating the second and third tergum (Mason 1981; Austin and Dangerfield 1993; Song and Chen 2008). Nixon (1970) revised 28 European *Microplitis* species. The Palaearctic species of the *Microplitis* were revised and keyed by Papp (1984), who recorded a total 68 species with description of seven new species. Gupta (2013)

revised Indian *Microplitis* species and described one new species.

Not much research has been done on the fauna of *Microplitis* in Iran. So far, six species of *Microplitis* have been recorded from Iran (Telenga 1955; Nixon 1968; Shenefelt 1973; Tobias 1976; Papp 1984; Fallahzadeh and Saghaei 2010; Ghahari *et al.* 2011a,b; Rastegar *et al.* 2012). Here, we present the first record of *Microplitis rufiventris* Kokujev, 1914 from Iran.

Study material was collected from different habitats of Northern Iran during March to November of 2010 and 2011 using Malaise traps. The specimens were taken from the traps at weekly intervals. Later the dried specimens were card-mounted and labelled. Identifications were performed using keys by Papp (1984) and Tobias *et al.* (1986). The photographs were taken using an Olympus SZX9 stereomicroscope equipped with a Sony CCD digital camera. Morphological terminology follows van Achterberg (1993). The specimens are deposited in the insect collection of the Department of Entomology, Tarbiat Modares University, Tehran, Iran and the Naturalis Biodiversity Center, Leiden, Netherlands.

A total of 166 and 29 specimens of *Microplitis rufiventris* and *M. ochraceus* were collected from the studied area, respectively.

***Microplitis ochraceus* Szepilgeti, 1896 (Figure 1 A-C)**

Material examined: Alborz province, Karadj (35°46' N, 50°56' E, 1277m a.s.l.), 05–13.vii.2010, 1♀; Tehran province, Shahriar (35°40' N, 50°56' E, 1168m a.s.l.), 07–14.vi.2010, 1♂; 12–19.vii.2010, 1♀; 19–27.vii.2010, 1♀; 30.viii–06.ix.2010, 2♀♀; 06–13.ix.2010, 6♀♀, 1♂; 13–20.ix.2010, 1♀, 1♂; 21–27.ix.2010, 2♀♀, 11♂♂; 27.ix–04.x.2010, 1♀; leg. A. Nadimi.

Diagnosis (Female): Body length 3.5–4.0 mm, pterostigma brown with pale yellow spot basally, vein 1-SR+M of fore wing straight (Figure 1C); mesonotum and scutellum rugose (Figure 1B); first metasomal tergite strongly broadening posteriorly, as long as its width, completely rugose, second tergite rugose (Figure 1B);

body reddish yellow (Figure 1A), mesosoma sometimes with variable blackish pattern.

Biology: *Microplitis ochraceus* has been recorded as a parasitoid of the Lead-coloured Drab, *Orthosia populeti* (Fabricius, 1781) (Lepidoptera: Noctuidae) (Györfi 1959).

Distribution: Azerbaijan, Greece, Hungary, Kazakhstan, Moldova, Mongolia, Russia, Ukraine (Yu et al. 2012), Iran (Telenga 1955).

***Microplitis rufiventris* Kokujev, 1914 (Figure 2 A-C)**

Material examined: Alborz province, Karadj (35°46' N, 50°56' E, 1277m a.s.l.), 15–22.vi.2010, 1♂; Tehran province, Shahriar (35°40' N, 50°56' E, 1168m a.s.l.), 24–31.viii.2010, 4♀♀; 31.viii–07.ix.2010, 10♀♀, 5♂♂; 07–14.ix.2010, 23♀♀, 16♂♂; 14–22.ix.2010, 10♀♀, 16♂♂; 22–28.ix.2010, 14♀♀, 34♂♂; 28.ix–05.x.2010, 3♀♀, 20♂♂; 05–12.x.2010, 1♀, 9♂♂; 12–19.x.2010, 1♂; leg. M. Khayrandish.

Diagnosis (Female): Body length 2.8–3.5 mm; pterostigma dark brown with pale yellow spot basally, vein 1-SR+M of fore wing slightly curved (Figure 2C); mesonotum rugose, scutellum more or less shiny (Figure 2B); first metasomal tergite sub-parallel sided and

rounded at apex, about twice times as long as its medial width, smooth and shiny or weakly sculptured, second tergite smooth (Figure 2B); head and mesosoma black, metasoma reddish yellow except apex black (Figure 2A).

Biology: This species is a solitary endoparasitoid of *Helicoverpa armigera* (Hübner, 1809), *Spodoptera ciliatum* (Guenée, 1852), *S. exigua* (Hübner, 1808) and *S. littoralis* (Boisduval, 1833) (Yu et al. 2012). This species is known as a biological control agent against *Spodoptera frugiperda* (Smith, 1797) (Coulson 1994). In the field, this parasitoid shows preference towards early larval instars (late first to early fourth) (Hegazi et al. 2013). Some aspects of the reproductive biology of *M. rufiventris* were documented by Hegazi et al. (2007).

Distribution: Afghanistan, China, Cyprus, Egypt, Israel, Jordan, Romania, Turkey, Turkmenistan, Uzbekistan (Yu et al. 2012). New record from Iran.

The specimens were collected using 32 Malaise traps. The Malaise traps were placed in different habitats such as forests, pastures and orchards. Our study showed that



FIGURE 1. *Microplitis ochraceus* Szepligeti, 1896: A. Habitus, dorsal view, B. Mesosoma and part of metasoma, C. Fore wing.

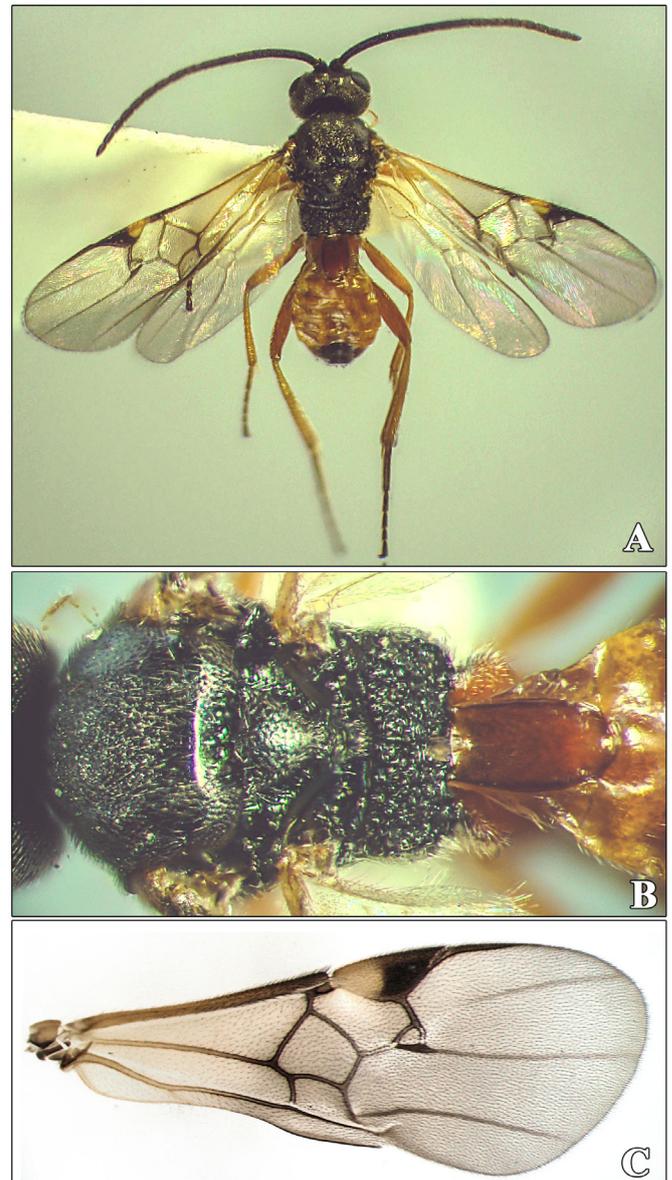


FIGURE 2. *Microplitis rufiventris* Kokujev, 1914: A. Habitus, dorsal view, B. Mesosoma and part of metasoma, C. Fore wing.

Microplitis rufiventris and *M. ochraceus* were only found in Tehran (Shahriar) and Alborz (Karadj) provinces. Both these regions consist of cultivated crops and orchards. Hence these parasitoids are acting as natural biological control agents of the most important pests in these regions and this biological activity can be later harnessed at a much larger scale through mass production if need arises. According to our sampling, most of the specimens were captured from June to October and both species were active during the growing season.

Acrolyta stroudi Gauld (Ichneumonidae) and *Conura convergea* Delvare (Chalcididae) have been recorded as hyperparasitoids of *Microplitis* from Costa Rica (Janzen et al. 2003).

Among the neighboring countries of Iran, the records of *Microplitis* are still restricted to *M. mediator* (Haliday) and *M. spectabilis* (Haliday) from Pakistan (Cameron 1906;

Khan 1999), *M. rufiventris* Kokujev, *M. strenuous* Reinhard and *M. tadzhicus* Telenga from Afghanistan (Hedwig 1961; Tobias et al. 1998), *M. erythogaster* Abdinbekova, *M. spinolae* (Nees) and *M. tazhicus* from Tajikistan (Telenga 1949; Tobias and Saidov 1992), while about 30 species have been recorded from Turkey (Inanç 1997, 2002; Inanç and Beyarslan 1997, 2001; Beyarslan et al. 2002) and Russia (Telenga 1955; Tobias 1971, 1976; Tobias et al. 1986; Papp 1984; Kotenko 1994). So far, seven species of this genus are known from Iran (Table 1) (*M. aduncus* (Ruthe, 1860), *M. deprimator* (Fabricius, 1798), *M. ochraceus* Szépligeti, 1896, *M. rufiventris* Kokujev, 1914, *M. scrophulariae* Szépligeti, 1898, *M. spectabilis* (Haliday, 1834) and *M. viduus* (Ruthe, 1860)) and comprises about 9% of the species of Palaearctic fauna. Iran is a large country, incorporating various geographical regions and climates, indicating a need for further studies.

TABLE 1. Updated list of *Microplitis* species recorded from Iran.

<i>Microplitis</i> species	Distribution in Iran (provinces)	References
<i>M. aduncus</i> (Ruthe, 1860)	Province not defined	Papp (1984)
<i>M. deprimator</i> (Fabricius, 1798)	Province not defined	Nixon (1968)
<i>M. ochraceus</i> Szépligeti, 1896	Ardabil province (Mugan) Tehran and Alborz provinces	Telenga (1955) This study
<i>M. rufiventris</i> Kokujev, 1914	Tehran and Alborz provinces	This study
<i>M. scrophulariae</i> Szépligeti, 1898	Province not defined Isfahan province (Kashan)	Tobias (1976) Ghahari et al. (2011b)
<i>M. spectabilis</i> (Haliday, 1834)	Isfahan province East Azarbaijan province	Ghahari et al. (2011b) Rastegar et al. (2012)
<i>M. viduus</i> (Ruthe, 1860)	Qazvin province	Ghahari et al. (2011a)

ACKNOWLEDGMENTS: Thanks to the Department of Entomology, Tarbiat Modares University for providing financial support for this study. We are also grateful to two anonymous reviewers for their valuable comments on the earlier version of this paper and Dr. D. Yu for sending valuable papers. Many thanks to Dr. Ahmad Nadimi and Mohammad Khayrandish for helping us in the trapping and collecting specimens.

LITERATURE CITED

- Austin, A.D and P.C. Dangerfield. 1993. Systematics of Australian and New Guinean *Microplitis* Foerster and *Snellenius* Westwood (Hymenoptera: Braconidae: Microgastrinae), with a review of their biology and host relationships. *Invertebrate Taxonomy* 7: 1097–1166.
- Beyarslan, A., F. Inanç, O. Cetin and M. Aydogdu. 2002. Braconiden von den tuerkischen Inseln Imbros und Tenedos (Hymenoptera, Braconidae: Agathidinae, Braconinae, Cheloninae, Microgastrinae). *Entomofauna* 23(15): 173–188.
- Cameron, P. 1906. On the Tenthredinidae and parasitic Hymenoptera collected in Baluchistan by Major C. G. Nurse. Part I. *Journal of the Bombay Natural History Society* 17: 89–107.
- Coulson, J.R. 1994. *Releases of beneficial organisms in the United States and Territories-1983*. Washington D.C: U. S. Department of Agriculture, Agricultural Research Service, 113 pp.
- Fallahzadeh, M. and N. Saghaei. 2010. Checklist of Braconidae (Insecta: Hymenoptera) from Iran. *Munis Entomology & Zoology* 5(1): 170–186.
- Ghahari, H., M. Fischer and J. Papp. 2011a. A study on the Braconidae (Hymenoptera: Ichneumonoidea) from Qazvin province, Iran. *Entomofauna* 32(9): 197–208.
- Ghahari, H., M. Fischer and J. Papp. 2011b. A study on the braconid wasps (Hymenoptera: Braconidae) from Isfahan province, Iran. *Entomofauna* 32(16): 261–272.
- Gupta, A. 2013. Revision of the Indian *Microplitis* Foerster (Hymenoptera: Braconidae: Microgastrinae), with description of one new species. *Zootaxa* 3620(3): 429–452.
- Györfi, J. 1959. Neuere Beiträge zur Kenntnis der Wirte der Braconiden (Hymenoptera: Braconidae). *Beiträge zur Entomologie* 9(1-2): 140–143.
- Hedwig, K. 1961. Ergebnisse der Deutschen Afghanistan-Expedition 1956

- der Landessammlungen für Naturkunde Karlsruhe. Ichneumonidae, Braconidae (Hymenoptera). *Beiträge zur Naturkundlichen Forschung in Südwestdeutschland* 19: 291–298.
- Hegazi, E.M., G.M. Abdel-Aziz, A.Y. El-Shazly and W.E. Khafagi. 2007. Influence of host age and host deprivation on longevity, egg load dynamics and oviposition rate in *Microplitis rufiventris*. *Insect Science* 14: 485–495.
- Hegazi, E., W. Khafagi and F. Schlyter. 2013. Egg maturation dynamics of the parasitoid *Microplitis rufiventris*: Starvation speeds maturation in early life. *Physiological Entomology* 38:233–240.
- Inanç, F. 1997. The Microgastrinae (Hymenoptera: Braconidae) fauna of the Thrace region of Turkey. *Turkish Journal of Zoology* 21(2): 135–165.
- Inanç, F. 2002. A new species of *Microplitis* (Hymenoptera: Braconidae, Microgastrinae) from Turkey. *Biologia* 57(5): 563–566.
- Inanç, F. and A. Beyarslan. 1997. Microgastrinae (Hymenoptera: Braconidae) species collected from some provinces of Gaziantep and Sanliurfa. *Turkiye Entomoloji Dergisi* 21(3): 213–223.
- Inanç, F. and A. Beyarslan. 2001. A study on Microgastrinae (Hymenoptera: Braconidae) species in Gokceada and Bozcaada. *Turkish Journal of Zoology* 25(3) :287–296.
- Janzen, D.H., A.K. Walker, J.B. Whitfield, G. Delvare and I.D. Gauld. 2003. Host-specific and hyperparasitoids of three new Costa Rican species of *Microplitis* Foerster (Hymenoptera: Braconidae: Microgastrinae), parasitoids of sphingid caterpillars. *Journal of Hymenoptera Research* 12: 42–76.
- Khan, S.M. 1999. Effectiveness of *Microplitis mediator* (Hym.: Braconidae) against its hosts *Agrotis segetum* and *A. ipsilon* (Lepidoptera: Noctuidae). *Pakistan Journal of Biological Sciences* 2(2): 344–346.
- Kotenko, A.G. 1994. On the braconid-fauna (Hymenoptera, Braconidae) of the Dahuria; pp. 79–89, in: A. G. Kotenko (ed.). *Hymenopteran insects of Siberia and Far East: memoirs of the Daurisky Nature Reserve, no. 3*. Institut Zoologii NAN Ukrainy: Kiev.
- Mason, W.R.M. 1981. The polyphyletic nature of *Apanteles* Förster (Hymenoptera: Braconidae): A phylogeny and reclassification of Microgastrinae. *Memoirs of the Entomological Society of Canada* 115:1–147.
- Nixon, G.E.J. 1965. A reclassification of the tribe Microgasterini (Hymenoptera: Braconidae). *Bulletin of the British Museum (Natural His-*

- tory), *Entomology Supplement* 2: 1–284.
- Nixon, G.E.J. 1968. A revision of the genus *Microgaster* Latreille (Hymenoptera: Braconidae). *Bulletin of the British Museum (Natural History), Entomology series* 22: 33–72.
- Nixon, G.E.J. 1970. A revision of the northwestern European species of *Microplitis* Förster (Hymenoptera: Braconidae). *Bulletin of the British Museum (Natural History), Entomology series* 25: 1–30.
- Papp, J. 1979. Braconidae (Hymenoptera) from Tunisia, 1. *Folia Entomologica Hungarica* 32: 175–87.
- Papp, J. 1984. Palaearctic species of *Microgaster* Latreille (= *Microplitis* Förster) with description of seven new species (Hymenoptera, Braconidae, Microgastrinae). *Entomologische Abhandlungen* 47: 95–140.
- Papp, J. 1986. First survey of the *Glabromicroplitis* Papp species of the Holarctic region, with taxonomic remarks of three *Microgaster* Latreille species (Hymenoptera, Braconidae: Microgastrinae). *Annales Historico-naturales Musei Nationalis Hungarici* 78: 249–53.
- Rastegar, J., H. Sakenin, S. Khodaparast and M. Havaskary. 2012. On a collection of Braconidae (Hymenoptera) from East Azarbaijan and vicinity, Iran. *Calodema* 226 :1–4.
- Shaw, M.R. and T. Huddleston. 1991. Classification and biology of braconid wasps (Hymenoptera: Braconidae). *Handbooks for Identification of British Insects* 7(11): 1–126.
- Shenefelt, R.D. 1973. Braconidae 5. Microgasterinae & Ichneutinae. *Hymenopterorum Catalogus (nova editio)* 9: 669–812.
- Song, D. and J. Chen. 2008. Five new species of the genus *Microplitis* (Hymenoptera: Braconidae: Microgastrinae) from China. *Florida Entomologist* 91: 283–293.
- Telenga, N.A. 1949. Faunal list of parasites of the family Braconidae (Hymenoptera). Tadzhikistan. *Entomologicheskoye Obozreniye* 30: 381–388.
- Telenga, N.A. 1955. *Braconidae, subfamily Microgasterinae, subfamily Agathidinae. Fauna USSR, Hymenoptera*. Russia: USSR Academy of Sciences Publisher. 312 pp.
- Tobias, V.I. 1971. Review of the Braconidae (Hymenoptera) of the U.S.S.R. *Trudy Vsesoyuznogo Entomologicheskogo Obshchestva* 54: 156–268.
- Tobias, V.I. 1976. *Braconids of the Caucasus (Hymenoptera, Braconidae)*. Opred. Faune SSSR. Leningrad: Nauka Press. 286 pp.
- Tobias, V.I., N.A. Telenga and A.G. Kotenko. 1986. Subfamily Microgastrinae; pp. 605–815, in: G.S. Medvedev (ed.). *Keys to the Insects of the European Part of the USSR* Volume III, Hymenoptera Part IV. New Delhi: Amerind Publishing Co.
- Tobias, V.I. and N.S. Saidov. 1992. Effect of wind on diel activity of parasitic hymenopterous insects (with braconid wasps as an example) (Hymenoptera Parasitica, Braconidae). *Entomological Review* 74(6): 114–122.
- Tobias, V.I., M. Capek and P. Lauterer. 1998. Braconidae (Hymenoptera) from Afghanistan in the collections of the Moravian Museum. *Acta Musei Moraviae Scientiae Biologicae* 82:173–190.
- van Achterberg, C. 1976. A preliminary key to the subfamilies of the Braconidae (Hymenoptera). *Tijdschrift Voor Entomologie* 119: 33–78.
- van Achterberg, C. 1993. Illustrated key to the subfamilies of the Braconidae (Hymenoptera: Ichneumonoidea). *Zoologische Verhandlungen (Leiden)* 283: 1–189.
- Wilkinson, D.S. 1930. A revision of the Indo-Australian species of the genus *Microplitis* Foerster (Hymenoptera: Braconidae). *Bulletin of Entomological Research* 21: 23–27.
- Yu, D.S., C. van Achterberg and K. Horstmann. 2012. *Ichneumonoidea 2011. (Biological and taxonomical information)*, Taxapad Interactive Catalogue, Ottawa. Accessible at <http://www.taxapad.com/>. Captured on 10 January 2014.

RECEIVED: January 2014

ACCEPTED: March 2014

PUBLISHED ONLINE: May 2014

EDITORIAL RESPONSIBILITY: Benoit Guénard