



Ichneumonid parasitoids (Hymenoptera: Ichneumonidae) of fruit flies (Diptera: Tephritidae) in the northwest of Iran

Alireza Pourhaji¹, Hossein Lotfalizadeh¹, Reza Farshbaf-Pourabad², Babak Gharali³ and Abbas Mohammadi-Khoramabadi⁴

¹ Department of Plant Protection, East-Azərbayjan Agricultural and Natural Resources Research Center, Agricultural Research, AREEO, Tabriz, Iran.

² Department of Plant Protection, University of Tabriz, Tabriz, Iran.

³ Department of Plant Protection, Qazvin Agricultural and Natural Resources Research Center, Agricultural Research, AREEO, Qazvin, Iran.

⁴ Department of Plant Production, College of Agriculture and Natural Resources of Darab, Shiraz University, Iran.

ABSTRACT. This study was conducted to collect and identify ichneumonid parasitoids of tephritid fruit flies (Diptera: Tephritidae) feeding on the plants of the family Asteraceae in the northwest of Iran during 2013-2015. Five species of ichneumon wasps on five species of fruit flies were reared. They were as follows: *Cremastus lineatus* on *Urophora terebrans*; *Diadegma maculatum* on *Hyphenidium robrowskii*; *Scambus brevicornis* on *Sphenella marginata*, *Scambus rufator* on *Terellia gynacochroma* and *Urophora* sp. and *Tranosema* sp. on *Tephritis* sp. *dioscurea* group. Of them, *Cremastus lineatus*, *S. rufator* and *Tranosema* sp. are new records for ichneumonid fauna of Iran. All host-parasitoid-plant associations were newly established to the science. General distribution of these parasitoids and their biological associations were discussed.

Key words: Host, distribution, new record, Palaearctic.

Received:
28 April, 2016

Accepted:
10 July, 2016

Published:
18 July, 2016

Subject Editor:
Samira Farahani

Citation: Pourhaji, A., Lotfalizadeh, H., Farshbaf-Pouradab, R., Gharali, B. and Mohammadi-Khoramabadi, A. 2016. Ichneumonid parasitoids (Hym.: Ichneumonidae) of fruit flies (Dip.: Tephritidae) in the northwest of Iran. *Journal of Insect Biodiversity and Systematics*, 2 (2): 193-202.

Introduction

The family Ichneumonidae is known as the most diverse family of Hymenoptera parasitoid wasps in the world with more than 24481 described species classified into 8 higher groups and 48 subfamilies (Yu *et al.* 2012; together with subsequent described species). Almost all ichneumonids are parasitoid and mainly parasitize larvae of holometabolous insects through different host-parasitoid interactions and life history patterns (Belshaw and Quicke 2002; Quicke *et al.* 2009). Thus, they could play a substantial

role as biological control agents in decreasing the population of forest and agricultural pests (Bennet 2008).

Dipterans provide a large source of hosts for ichneumonid parasitoids. Their relationship may be vary from highly specific even at high taxonomic categories to general. Four families of Diptera are specific hosts of three subfamilies of Ichneumonidae (Quicke *et al.* 2009). Hover flies (Dip.: Syrphidae) are attacked by the wasps of the subfamily Diplazontinae

Corresponding author: Hossein Lotfalizadeh, E-mail: hlotfalizadeh@gmail.com

Copyright © 2016, Pourhaji et al. This is an open access article distributed under the terms of the Creative Commons Attribution License (CC BY NC 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

(Klopfstein 2014). Tipulids (Dip.: Tipulidae) are parasitized by members of the subfamily Cyloceriinae and species of Mycetophilidae and Sciaridae are known as hosts of Orthocentrinae (Wahland Gauld 1998). Other species of Diptera are attacked by wasps of eight subfamilies of Ichneumonidae, mainly Campopleginae, Cryptinae, Cremastinae, Ophioninae and Pimplinae (Yu *et al.* 2012).

Tephritid fruit flies (Dip.: Tephritidae) comprises more than 4400 phytophagous species in the world feeding on reproductive organs of plants (White 1988). Some species such as *Ceratitis capitata* (Wiedemann), *Bacterocera oleae* (Rossi) and *Rhagoletis cerasi* (L.) are among well-known and economically the most important pests of fruit crops around the world (Daniel and Grunder 2012). A wide effort has been made on the implementation and releasing the biological control agents as an ecologically safe and long term part of integrated pest management programs of tephritid fruit flies. For example, *Phygadeuon wiesmanni* Sachtleben, 1934 (Hym.: Ichneumonidae, Cryptinae) is a major parasitoid of European cherry fruit fly, *R. cerasi*, and released against *R. pomonella* (Walsh, 1867) from 1985 in Ontario (Hagely *et al.* 1993).

Plants of the family Asteraceae is one of the largest and economically most important family of flowering plants and consists of 12-17 tribes, approximately 1100 genera and 20,000 species (Cronquist 1981). Species of this family are of wide economic importance as vegetables (lettuce, artichokes and endive), sources of oil (sunflower, safflower) and insecticides (pyrethrum), and garden ornamentals (chrysanthemum, dahlia, marigold and many others) (Jansen and Palmer 1987).

Fruit flies are important widespread pests of crop fruits and vegetables, which infest a great variety of native and exotic

fruits (White 1988; Aluja and Norrbom 2001). Almost 250 species are known to be associated with plants and vegetables of economic importance, including about 100 that are pests, ranging in status from minor to very serious (White and Elson-Harris 1992). A few species induce the formation of galls in the upper or subterranean parts of stems of Asteraceae (Freidberg 1984; Korneyev 2003).

Till now, more than 502 species of the family Ichneumonidae have been recorded from Iran (Barahoei *et al.* 2012; Mohammadi-Khoramabadi *et al.* 2013a, b). Of them, 21 species belong to the subfamily Diplazontinae, parasitoids of hover flies (Dip.: Syrphidae) (Mohammadi-Khoramabadi *et al.* 2013a) and nine species to the subfamily Orthocentrinae, parasitoids of Mycetophilidae and Sciaridae (Mohammadi-Khoramabadi and Talebi 2013).

Fruit flies (Dip.: Tephritidae) have a rich species diversity. There is not a complete list of determined Iranian tephritids, but based on the available papers, it can estimate more than 120 species of this family were collected (Mohammadzade-Namin and Rasoulia 2009; Mohammadzade-Namin *et al.* 2010; Mohammadzade-Namin 2012; Gharajedaghi *et al.* 2012; Gharali *et al.* 2005).

Tephritid parasitoids were studied by Aluja *et al.* (1990), but in spite of the large material, of more than 1300 reared parasitoids, no ichneumonid wasp was recorded. Most parasitoid species recorded from fruit flies belonged to the families Braconidae, Figitidae, Eulophidae, Diapriidae, Chalcididae, Eurytomidae, and Pteromalidae (Wharton 1998; Sivinski *et al.* 2000; Ovruski *et al.* 2004; Gates *et al.* 2008).

This study was conducted to collect and identify ichneumonid parasitoids of tephritid fruit flies (Diptera: Tephritidae) feeding on the plants of the family Asteraceae in the northwest of Iran during 2013-2015.

Material and methods

This study was carried out in East and West-Azərbayjan provinces of Iran (from 35°58'- 39° 47' N to 44° 02'- 48° 21' E) during 2013 to 2015. Infested reproductive organs of six species of Asteraceae were widely collected and then were reared in separate boxes (3308cm³) at 25±2°C until the adults of flies and/or their parasitoids were appeared. Tephritidae and their ichneumonid parasitoids were identified using keys and descriptions provided by Korneyev and White (1999), Kasparyan (1981), Broad (2011), Townes (1969, 1970, 1971). Specimens were deposited in the insect collection of the Department of Plant Protection, East-Azərbayjan Research Center for Agriculture and Natural Resources, Tabriz and Department of Plant Production, College of Agriculture and Natural Resources of Darab, Shiraz University, Iran.

Results

A total of 13 adult individuals of ichneumonid parasitoids were reared on five species of tephritid fruit flies infesting six species of Asteraceae (Table 1). They represented five species belonging to three subfamilies, one from the subfamily Cremastinae, two from the subfamily Campopleginae and two from the subfamily Pimplinae as follow:

Subfamily Cremastinae Forster, 1869

Cremastus lineatus Gravenhorst, 1829 (Fig. 4)

Material examined: Iran, East-Azərbayjan, Aland (38°48'45"N, 44°33'56"E, 1722m), 10 July 2014, 3♂, ex *Urophora terebrans* (Loew) on *Onopordon* sp., leg.: A.R. Pourhaji.

Distribution within Iran: East-Azərbayjan (new record for Iran).

General distribution: Austria, Germany, Greece, Spain, Sweden, Turkey and Ukraine (Yu *et al.* 2012).

Host association: It was reared on *Urophora terebrans* (Dip.: Tephritidae) on the plant *Onopordon* sp. (Asteraceae) for the first time in this study. There was no any host record for this species.

Diagnosis: *Cremastus lineatus* can be distinguished from other species of the genus by a combination of the following characters: first tergite with the ventral edges medially closed together; second recurrent vein interstitial; in male ocelli large; head and thorax shiny, densely punctate and with red pattern; lateral lobes of mesocutum red; propodeum with areola 3 x as long as the posterior width (Fig. 4) (Kasparyan 1981).

Subfamily Campopleginae Forster, 1869

Diadegma maculatum (Gravenhorst, 1829) (Fig. 3)

Material examined: Iran, West-Azərbayjan, Shahin-Dejh (36°36'38"N & 46°33'52"E, 1370m), 19 August 2014, 1♀, ex *Hypenidium robrowskii* (Becker, 1908) on *Lactuca serriola* L.; Kilisa-Kandi (38°50'34"N & 44°27'38"E, 2319m), 6 August 2015, 1♂, reared on *Cirsium congestum* (Fisch. & C.A. Mey. ex DC), leg.: A.R. Pourhaji.

Distribution within Iran: Khorasan-e-Razavi province (Ghahari *et al.* 2014).

General distribution: Austria, Bulgaria, Finland, France, Italy, Poland, Turkey and United Kingdom (Yu *et al.* 2012).

Host association: *Hypenidium robrowskii* on *Lactucaserriola* L. (Asteraceae) is firstly reported as the host of this species.

Diagnosis: *Diadegma maculatum* can be identified by a combination of the following morphological characters (Fig. 3): head narrowed posteriorly; hind coxa black; hind tibia yellow-red at the middle and brown at the base and top; second and third metasomal tergites in their posterior margin red, the subsequent tergites entirely red; ovipositor sheath less

than 1.5 x as long as hind tibia; fore wing with an areolet; 7th metasomal tergite posteriorly with a deep median incision (Kasparyan 1981).

Tranosema sp. (Fig. 6)

Material examined: Iran, East-Azarbaijan, Arshad-Chamani (37°45'00"N & 46°18'55"E, 2847m), 11 August 2014, 1♂, ex *Tephritis* sp. *dioscurea* group on *Echinops* sp., leg.: A.R. Pourhaji.

Distribution within Iran: East-Azarbaijan province (new record for Iran).

General distribution: Holarctic (Yu *et al.* 2012).

Host association: Species of the genus are mainly parasitoids of Microlepidoptera (Yu *et al.* 2012). *Tephritis* sp. *dioscurea* group on *Echinops* sp. is newly established.

Diagnosis: The genus *Tranosema* can be identified by the following characters (Fig. 6): clypeus weakly convex; eyes weakly indented opposite antennal sockets; fore wing with an areolet; hind wing with nervellus vertical and not intercepted; posterior mesosternal carina medially absent; hind tibia with basal and apical dark bands; propodeal spiracle circular; propodeum with a short and wide areola which is confluent with the very wide petiolar area; first metasomal tergite with glymma (Townes 1970).

Subfamily Pimplinae Wesmael, 1845

Scambus brevicornis (Gravenhorst, 1829) (Fig. 5)

Material examined: Iran, East-Azarbaijan, Arshad-Chamani (37°45'00"N & 46°18'55"E, 2847m), 28 July 2014, 2♂, ex *Sphenella marginata* (Fallen, 1814) on *Senecio vulgare* L., leg.: A.R. Pourhaji.

Distribution within Iran: Kurdistan (Kolarov and Ghahari 2006) and Qazvin provinces (Ghahari and Schwarz 2012).

General distribution: Europe, North America, northern Africa and Middle East (Yu *et al.* 2012).

Host association. *Scambus brevicornis* is a very polyphagous parasitoid and has been reported on 133 host species on Hemiptera, Coleoptera, Lepidoptera, Diptera and Hymenoptera (Yu *et al.* 2012). Dipteran hosts of this species are *Chaetostomella cylindrica* (Robineau-Desvoidy, 1830), *Euphranta connexa* (Fabricius, 1794) and *Noeta pupillata* (Fallen, 1814) (Dip.: Tephritidae) and *Gimnomera dorsata* (Zetterstedt, 1838) (Dip.: Anthomyiidae) (Yu *et al.* 2012). In this study, the fourth host species of tephritid fruit fly, *Sphenella marginata* (Fallen, 1814) on *Senecio vulgare* L., has been recorded for this species.

Diagnosis: *Scambus brevicornis* can be separated from other species of the genus by a combination of the following characters: antenna short, as long as the distance between base of the fore wing to the pterostigma; upper angle of pronotum before tegula white; coxae black; trochanters yellow with black base; hind tibia white with dark pattern on base and top; all metasomal tergites black; metasomal tergites 6 and 7 with distinct and sharp edge punctures (Fig. 5) (Kasparyan 1981).

Scambus rufator Aubert, 1963 (Figs. 1-1, 2)

Material examined: Iran, East-Azarbaijan, Arshad-Chamani (37°45'00"N & 46°18'55"E, 2847m), 28 July 2014, 3♂1♀, ex *Terellia gynaecochochroma* (Hering) and *Urophora* sp. on *Onopordon acanthium* L.: in East-Azarbaijan, Kandovan (37°47'42"N & 46°14'58"E, 2265m), 22 September 2013, 2♂, ex *Terellia gynaecochochroma*, on *Onopordon acanthium*, leg.: A.R. Pourhaji.

Distribution within Iran: East-Azarbaijan (new record for Iran).

General distribution: Bulgaria, former Czechoslovakia, France, Italy, Romania, Turkey and former Yugoslavia (Yu *et al.* 2012).

Host association: This species has yet been reported only on *Chamaesphecia palustris* (Kautz, 1927) (Lep.: Sesiidae) (Yu *et al.* 2012). In this study, *Terellia gynaecochema* and *Urophora* sp. (Dip.: Tephritidae) on *Onopordon acanthium* L. were found as new hosts for *S. rufator*.

Diagnosis: *Scambus rufator* can be identified by the combination of the following characters: female (Fig. 1) with hind tibia monochrome red; metasomal tergites 1-4 red; first metasomal tergite laterally smooth and finely sculptured; ovipositor compressed laterally, about 0.8 x as long as metasoma; hypopygium with a large membranous area; male (Fig. 2) with hind tibia uniformly red; head distinctly narrowed posteriorly; propodeum with dorsal longitudinal carinae widely separated; first metasomal tergite as long as wide (Kasparyan 1981).

Discussion

From five parasitoid species reared on tephritid flies one genus and two species are new record for Iranian ichneumonid fauna. All host-parasitoid-plant associations were newly established to the science (Table 1).

In present study *Scambus brevicornis* and *Cremastus lineatus* were respectively the most abundant parasitoid species of fruit flies in the studied area (Fig. 2).

Ichneumonidae quite rarely parasitize dipterous hosts, and few ichneumonid subfamilies are trophically connected with flies. Two ichneumonid subfamilies, Diplazontinae and Orthocentrinae, are specialized on dipterous hosts of Syrphidae and Mycetophilidae, and most other host records from Diptera belong to Cryptinae and Pimplinae (Hoffmeister 1992; Hagley *et al.* 1993). López-Ortega and Khalaim (2012) reported for the first time, a *Calliephialtes* species associated

with Diptera, representing one of the few detailed records of an ichneumonid parasitoid on Tephritidae. *Calliephialtes sittenfeldae* was reported as a common parasitoid of the fruit fly *Anastrepha spatulata* Stone (Diptera: Tephritidae).

In the subfamily Cremastinae, the genus *Cremastus* Gravenhorst is a relatively large one with about 129 described species around the world (Yu *et al.* 2012). In Iran, there have been recorded just two species of the genus and *C. lineatus* is the third species reported here (Amiri *et al.* 2015; Barahoei *et al.* 2012). Members of the genus *Cremastus* associated with species from Coleoptera, Lepidoptera, Diptera and Hymenoptera (Yu *et al.* 2012). One species of the genus, *Cremastus incompletus* (Provancher, 1875), has been reported as a monophage parasitoid of *Rhagoletis pomonella* (Dip.: Tephritidae) in the world (Yu *et al.* 2012). Here we reported, the second genus, *Urophora* (Robineau-Desvoidy, 1830) of the family Tephritidae as host for this genus. Similar to *C. incompletus*, it may be possible that *C. lineatus* is a species-specific parasitoid for its hosts, *Urophora* sp.

Diadegma Förster is a large genus of the subfamily Campopleginae that mainly known as parasitoids of Microlepidoptera (Yu *et al.* 2012). From Cyclorrhapha, some species of the families Ephedridae, Chloropidae and Syrphidae has been reported as hosts of the genus (Yu *et al.* 2012). Tephritidae is established as the fourth cyclorrhaph family parasitized by one species of *Diadegma*. *Hypenidium* (Loew, 1862) has three species worldwide which of them two species occurred in Iran on the plant *Lactuca* spp. (Korneyev *et al.* 2011). A recent study showed that there were no any ichneumonids associated with its nearest species, *H. oculatum* in Iran (Mohammadi-Khoramabadi *et al.* 2014).

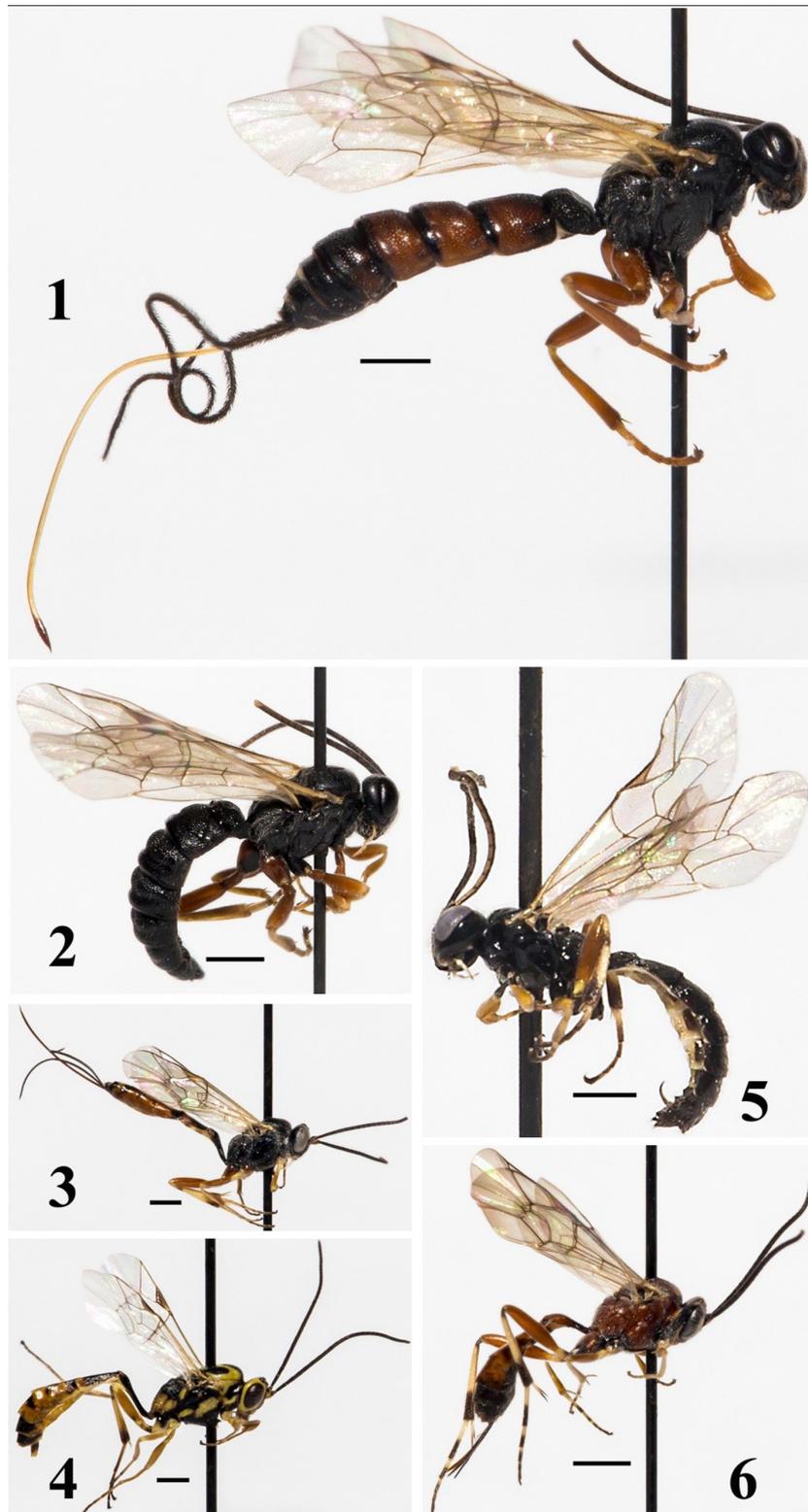
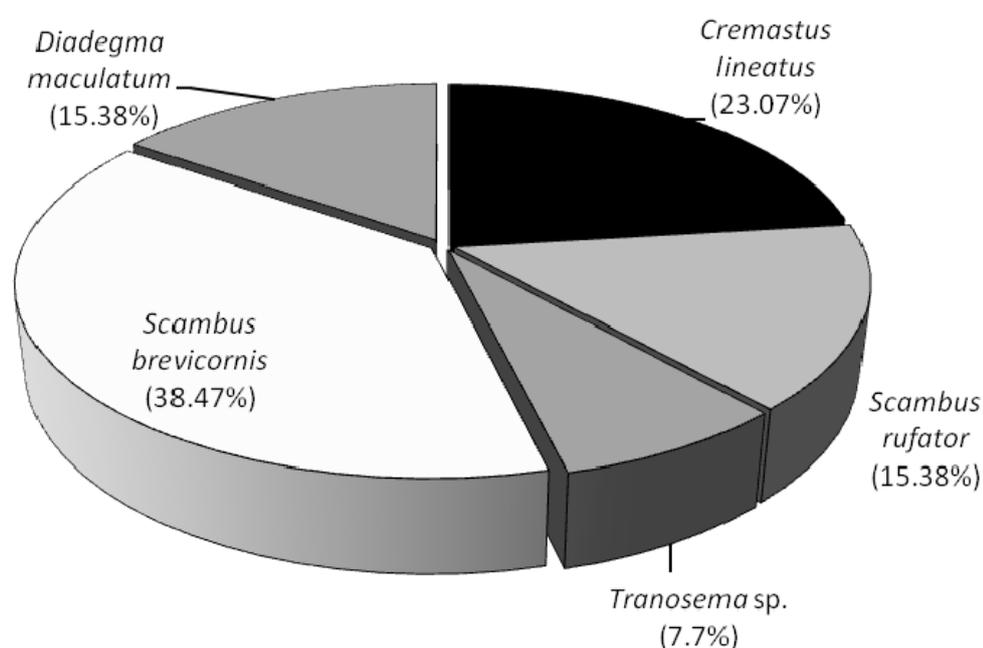


Figure 1-6. Ichneumonidae parasitoids of Tephritidae in Iran: **1.** *Scambus rufator* (female); **2.** *Scambus rufator* (male); **3.** *Diadegma maculatum* (female); **4.** *Cremastus lineatus* (male); **5.** *Scambus brevicornis* (male); **6.** *Tranosema* sp. (female) (scale bar: 1 mm).

Table 1. Tephritid hosts and host plants of Ichneumonidae in Iran († new record of parasitoid, * new host record, ** new host plant record).

Parasitoid	Hosts	Host plants	References
<i>Cremastus lineatus</i> †	<i>Urophora terebrans</i> *	<i>Onopordon</i> sp. **	Present study
<i>Diadegma maculatum</i>	<i>Hypenidium robrowskii</i> *	<i>Lactuca serriola</i> **	Present study
	Unknown species	<i>Cirsium congestum</i> **	Present study
<i>Scambus brevicornis</i>	<i>Sphenella marginata</i> *	<i>Senecio vulgare</i> **	Present study
<i>Scambus rufator</i> †	<i>Terellia gynaechroma</i> *	<i>Onopordon acanthium</i> **	Present study
	<i>Urophora</i> sp. *	<i>Onopordon acanthium</i> **	
<i>Tranosema</i> sp. †	<i>Tephritis dicoides</i> *	<i>Echinops</i> sp. **	Present study

**Figure 2.** Composition of ichneumonid parasitoids of Tephritidae (Dipera) in the northwest of Iran.

Acknowledgments

The authors thank the editor and two anonymous referees for their constructive comments and suggestions on the earlier version of this paper.

References

- Aluja, M., Guillen, J., Liedo, P., Cabrera, M., Rios, E., De La Rosa, G. and Celedonio, H. 1990. Fruit infesting tephritids (Dip.: Tephritidae) and associated parasitoids in Chiapas, Mexico. *Entomophaga*, 35: 39–48.
- Aluja, M. and Norrbon, A.L. 2001. *Fruit flies (Tephritidae): Phylogeny and evolution behavior*. Boca Raton, FL: CRC Press. 963 pp.
- Barahoei, H., Rakhshani, E. and Riedel, M. 2012. A checklist of Ichneumonidae (Hymenoptera: Ichneumonidae) from Iran. *Iranian Journal of Animal Biosystematics*, 8: 83–132.
- Belshaw, R. and Quicke, D.L.J. 2002. Robustness of ancestral state estimates: evolution of life history strategy in ichneumonoid parasitoids. *Systematic Biology*, 51: 450–477.
- Bennett, A.M.R. 2008. Review and identification keys to the ichneumonid parasitoids (Hymenoptera: Ichneumonidae) of Nearctic *Choristoneura* species (Lepidoptera: Tortricidae). *The Canadian Entomologist*, 140: 1–47.
- Broad, G. 2011. *Identification key to the subfamilies of Ichneumonidae (Hymenoptera)*. London, UK: The Natural History Museum.
- Cronquist, A. 1981. *An integrated system of classification of flowering plants* (Columbia Univ. Press, New York), pp. 1020–1028.
- Daniel, C. and Grunder, J. 2012. Integrated management of European cherry fruit fly *Rhagoletis cerasi* (L.): situation in Switzerland and Europe. *Insects*, 3: 956–988.
- Freidberg, A. 1984. Gall *Tephritidae* (Diptera). In: Ananthakrishnan T.N. (ed.), *Biology of gall insects*. Oxford and IBH Publishing Co., New Dehli, pp. 129–167.
- Gates, M., Mena-Correa, J., Sivinski, J., Ramírez-Romero, R., Córdova-García, G. and Aluja, M. 2008. Description of the immature stages of *Eurytoma sivinskii* Gates and Grissell (Hymenoptera: Eurytomidae), an ectoparasitoid of *Anastrepha* (Diptera: Tephritidae) pupae. *Entomological News*, 119: 354–360.
- Ghahari, H. and Schwarz, M. 2012. A study of the Ichneumonidae (Hymenoptera: Ichneumonoidea) from the Qazvin province, Iran. *Linzer boilogische Beitrage*, 44(1): 855–862.
- Ghahari, H., Ostovari, H., Jussila, R. and Behnood, S., 2014. A study on Ichneumonidae (Hymenoptera: Ichneumonoidea) from some regions of Khorasan province, north-eastern Iran. *Calodema*, 296: 1–2.
- Gharajedaghi, Y., Khaghaninia, S. and Farshbaf Pour Abad, R. 2012. An investigation of the fruit flies (Diptera: Tephritidae) Fauna in Ajabshir region (East Azerbaijan province) with the new record from Iran (part2). *Munis Entomology and Zoology Journal*, 7(2): 935–945.
- Gharali, B., Merz, B. and Lotfalizadeh, H. 2005. Report of *Urophora terebrans* (Loew, 1850) (Diptera: Tephritidae) on *Centurea* from Iran. *Entomology and Phytopathology*, 72(2): 39–93.
- Jansen, R.K. and Palmer, J.D. 1987. A chloroplast DNA inversion marks an ancient evolutionary split in the sunflower family (Asteraceae). *Proceedings of the National Academy of Sciences USA*, 84: 5818–5822.
- Hagley, E.A.C., Biggs, A.R., Timbers, G.E. and Coutu- Sundy, J. 1993. Effect of age of the puparium of the apple maggot, *Rhagoletis pomonella* (Walsh) (Diptera: Tephritidae), on parasitism by *Phygadeuon wiesmanni* Sachtl. (Hymenoptera: Ichneumonidae). *The Canadian Entomologist*, 125: 721–724.
- Hoffmeister, T.S. 1992. Factors determining the structure and diversity of parasitoid complexes in tephritid fruit flies. *Oecologia*, 89: 288–297.
- Kasparyan, D.R. 1981. *A guide to the insects of the European part of the USSR. Hymenoptera, Ichneumonidae*. Leningrad, Russia: Opredelitel Faune SSSR, 688 p.
- Klopfstein, S. 2014. Revision of the western Palaearctic Diplazontinae (Hymenoptera, Ichneumonidae). *Zootaxa*, 3801: 1–143.
- Kolarov, J., Ghahari, H., 2006. A study of the Iranian Ichneumonidae (Hymenoptera): I. Pimplinae and Tryphoninae. *Zoology in the Middle East*, 38: 63–68.
- Korneyev, V.A. 2003. New and little-known Tephritidae (Diptera, Cyclorhapha) from Europe. *Vestnik zoologii*, 37: 3–12.

- Korneyev, V. A. and White, I. M. 1999. Tephritids of the genus *Urophora* R-D. (Diptera: Tephritidae) of East Palaearctic: III Key to Palaearctic species. *Entomologiceskoe Obozrenie*, 78(2): 464–482.
- Korneyev, V.A., Gharali, B., Rakhshani, H. 2011. A review of the genus *Hypenidium* Loew, 1862 (Diptera: Tephritidae). *Ukrainska Entomofaunistyka*, 2(4): 39–46.
- López-Ortega, M. and Khalaim, A.I. 2012. First record of *Calliephialtes sittenfeldae* associated with the tephritid fruit fly *Anastrepha spatulata* in Mexico. *Journal of Insect Science*, 12: 31–38.
- Mohammadi-Khoramabadi A., Lotfalizadeh H., Gharali B. and Moghaddam M. 2014. Two new records of Chalcidoidea (Hymenoptera) from Iran. *Journal of Entomological Society of Iran*, 34: 75–76.
- Mohammadi-Khoramabadi, A. and Talebi, A.A. 2013. A study of the genus *Orthocentrus* (Hymenoptera: Ichneumonidae, Orthocentrinae) in Gilan and Tehran provinces of Iran, with first records of seven species and one subspecies. *Applied Entomology and Phytopathology*, 80: 29–39.
- Mohammadi-Khoramabadi, A., Talebi, A.A. and Zwakhals, K. 2013a. Study on Diplazontinae (Hymenoptera: Ichneumonidae) in the north central of Iran. *Journal of Crop Protection*, 2: 241–261.
- Mohammadi-Khoramabadi, A., Talebi, A.A. and Zwakhals, K. 2013b. A study of the subfamily Pimplinae (Hymenoptera: Ichneumonidae) in the north of Iran, with eleven new species records. *Entomofauna*, 34: 29–56.
- Mohammadzade-Namin, S. 2012. A new species of *Tephritis* Latreille (Diptera: Tephritidae) from Iran. *Entomologica Fennica*, 22: 284–288.
- Mohammadzade-Namin, S. and Rasouljan, G. R. 2009. A review of fruit flies of the genus *Rhagoletis* (Dip.: Tephritidae) of Iran and bordering countries, with the key to species. *Vestnik Zoologii*, 43: 25–30.
- Mohammadzade-Namin, S., Nozari, J. and Rasolian, G.H. 2010. The fruit flies (Diptera, Tephritidae) in Tehran province, with new records for Iranian fauna. *Vestnik Zoologii*, 44(1): 20–31.
- Ovruski, S.M., Schliserman, P. and Aluja, M. 2004. Indigenous parasitoids (Hymenoptera) attacking *Anastrepha fraterculus* and *Ceratitis capitata* (Diptera: Tephritidae) in native and exotic host plants in Northwestern Argentina. *Biological Control*, 29: 43–57.
- Quicke, D.L.J., Laurenne, N.M., Fitton, M.G. and Broad, G.R. 2009. A thousand and one wasps: a 28S rDNA and morphological phylogeny of the Ichneumonidae (Insecta: Hymenoptera) with an investigation into alignment parameter space and elision. *Journal of Natural History*, 43: 1305–1421.
- Sivinski, J., Piñero, J. and Aluja, M. 2000. The distributions of parasitoids (Hymenoptera) of *Anastrepha* fruit flies (Diptera: Tephritidae) along an altitudinal gradient in Veracruz, Mexico. *Biological Control*, 18: 258–269.
- Townes, H. 1969. The genera of Ichneumonidae, part 1. *Memoirs of the American Entomological Institute*, 11: 1–300.
- Townes, H. 1970. The genera of Ichneumonidae, part 3. *Memoirs of the American Entomological Institute*, 13: 1–307.
- Townes, H. 1971. The genera of Ichneumonidae, part 4. *Memoirs of the American Entomological Institute*, 17: 1–372.
- Wahl, D.B. and Gauld, I.D. 1998. The cladistics and higher classification of the Pimpliformes (Hymenoptera: Ichneumonidae). *Systematic Entomology*, 23: 265–298.
- Wharton, R.A., Ovruski, S.M. and Gilstrap, F.E. 1998. Neotropical Eucoilidae (Cynipoidea) associated with fruit infesting Tephritidae, with new records from Argentina, Bolivia and Costa Rica. *Journal Hymenoptera Research*, 7: 102–115.
- White, I. M. 1988. *Tephritid flies*. In: *Handbooks for the identification of British insects*. Royal Entomological Society of London, 10: 134 pp.
- White, I.M. and Elson-Harris, M.M. 1992. *Fruit flies of economic significance: Their identification and bionomics*. Wallingford; CAB International, 601 pp.
- Yu, D.S., van Achterberg, K. and Horstmann, K. 2012. World Ichneumonidae 2011. Taxonomy, Biology, Morphology and Distribution. Ottawa, Ontario, Canada: www.Taxapad.com, accessed at : 09.April.2016.

زنبورهای ایکنئومونید (Hymenoptera: Ichneumonidae) پارازیتوئید مگس های میوه (Diptera: Tephritidae) در شمال غرب ایران

علیرضا پور حاجی، حسین لطفعلی زاده، رضا فرشباغ-پور آباد، بابک قرالی، عباس محمدی خرم آبادی

۱ گروه گیاهپزشکی، مرکز تحقیقات کشاورزی و منابع طبیعی استان آذربایجان شرقی، تحقیقات کشاورزی، تبریز، ایران

۲ گروه گیاهپزشکی، دانشگاه تبریز، تبریز، ایران

۳ گروه گیاهپزشکی، مرکز تحقیقات کشاورزی و منابع طبیعی قزوین، تحقیقات کشاورزی، قزوین، ایران

۴ گروه گیاهپزشکی، دانشکده کشاورزی و منابع طبیعی داراب، دانشگاه شیراز، شیراز، ایران

* پست الکترونیکی نویسنده مسئول مکاتبه: hlotfalizadeh@gmail.com

تاریخ دریافت: ۹ اردیبهشت ۱۳۹۵، تاریخ پذیرش: ۲۰ تیر ۱۳۹۵، تاریخ انتشار: ۲۸ تیر ۱۳۹۵

چکیده: این تحقیق به منظور جمع آوری و شناسایی زنبورهای پارازیتوئید مگس های میوه (Diptera: Tephritidae) که از گیاهان خانواده Asteraceae در شمال غرب ایران تغذیه می کنند در طی سال های ۱۳۹۲-۱۳۹۴ انجام شد. پنج گونه زنبور ایکنئومونید روی پنج گونه از مگس های میوه پرورش داده شد که عبارتند از: *Cremastus lineatus* روی *Diadegma maculatum*، *Urophora terebtans* روی *Sphenella marginata*، *Scambus brevicornis* روی *Hyphenidium robrowskii*، *Scambus rufator* روی *Terellia gynacochroma* و *Urophora sp.* و *Tranosema sp.* روی *Tephritis sp. dioscurea group*. از بین آنها گونه های *Cremastus lineatus*، *S. rufator*، *Tranosema sp.* گزارش جدید برای فون زنبورهای ایکنئومونید ایران هستند. همه ارتباطات پارازیتوئید-میزبان برای دنیای علم جدید هستند. انتشار جغرافیایی پارازیتوئیدها و ارتباطات زیستی آنها مورد بحث قرار گرفته است.

واژگان کلیدی: میزبان، انتشار، گزارش جدید، پالئوکتیک