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Fruit flies (Dip.: Tephritidae) reared from capitula of Asteraceae in the Urmia region, Iran

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Abstract

A list of 20 species of the subfamily Tephritinae (Diptera: Tephritidae) from the Urmia region (Azarbaijan-e Gharbi province, Iran) is presented. The specimens were collected during 2005-2008 from six different localities. Adults were obtained from overwintering and mature seed heads of 17 plant species of Asteraceae. The species, *Urophora xanthippe* (Munro, 1934) is newly recorded for the fauna of Iran. Thirteen new host plants are also reported for the first time. The host plants, collection date, locality as well as general distribution and associated plants of each species are given.

Key words: Tephritidae, fauna, Asteraceae, host plants, fruit flies, Urmia, Iran

چکیده

فهرستی شامل ۲۰ گونه از مگس‌های زیرخانواده‌ی Tephritinae (Diptera: Tephritidae) از منطقه‌ی ارومیه (استان آذربایجان غربی) معرفی شده است. این گونه‌ها در طول بررسی‌های انجام‌شده در سال‌های ۱۳۸٤ تا ۱۳۸۷ از شش منطقه‌ی مختلف در اطراف ارومیه جمع‌آوری شدند. حشرات کامل گونه‌های فوق از طبق‌های زمستان‌گذران و بالغ ۱۷ گونه‌ی گیاهی تیره‌ی آفتابگردان (Asteraceae) به‌دست آمدند که از بین آن‌ها *Urophora xanthippe* (Munro, 1934) برای فون ایران جدید بوده و ۱۳ گونه‌ی گیاهی به عنوان میزبان جدید برای مگس‌های این خانواده گزارش می‌شوند. گیاهان میزبان، تاریخ و محل جمع‌آوری این مگس‌ها در منطقه به همراه حوزه‌ی انتشار عمومی و گیاهان مرتبط با هر گونه ارائه شده است.

واژگان کلیدی: فون، Tephritidae، Asteraceae، میزبان‌های گیاهی، مگس‌های میوه، ارومیه، ایران

Introduction

Fruit flies (Tephritidae) are cosmopolitan and also one of the largest families of acalypterate Diptera, comprising over 4300 valid species worldwide (Norrbom, 2004). They contain medium sized flies with often a characteristic wing patterns (Foote & Steyskal, 1987; White & Elson-Harris, 1992). Almost all fruit flies are phytophagous and can be broadly divided into fruit infesting and non-fruit infesting species. Many species, especially those of the subfamily Tephritinae, are associated with the flowerheads of Asteraceae and usually do not attack economically important crops (Freidberg & Kugler, 1989; White & Elson-Harris, 1992; Headrick & Goeden, 1998). Because the non-frugivorous tephritids are capable of causing substantial damage to their host plants, some species are valuable agents for the biological control of weeds and some have been successfully used in programs of biological control of noxious weeds (Zwölfer, 1983; White, 1988; Harris, 1989; White & Elson-Harris, 1992; Turner, 1996).

Very little is known about the host range and distribution of Iranian flowerhead infesting

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tephritids with the exception of a checklist written by Gilasian (2007) based on the specimens deposited in the Hayk Mirzayans Insect Museum (Iranian Research Institute of Plant Protection) collected during the past 40 years. This checklist includes 3 subfamilies, 8 tribes, 24 genera and 50 species.

The current study is intended to improve our understanding about the fruit flies and their associate host plants and distribution in Iran.

Materials and methods

Adults of fruit flies were taken from samples of different plant species of the Asteraceae. They were collected during the years 2005-2008 from various sites in Urmia region favours to spelling, Orümïyeh (N 37° 07′ - 38° 08′, E 44° 23′ - 45° 24′), Azarbaijan-e Gharbi province, Iran (Anonymous, 2006). Overwintering and mature flowerhead samples were collected in March and July-August, respectively. Each sample consisted of 30-100 randomly collected flowerheads. The flowerheads were taken to the laboratory and placed into separate glass boxes (30 × 40 × 60 cm) covered by muslin. The number of individuals of each species and its related host plant were recorded. Geographical coordinates of the localities are as follows (Anonymous, 2006):

Täzehkand-e Qäterchï: N 37° 39′ - E 44° 58′, 1335 m, 13 km SW Urmia; **Alïkän (Qüshchï Pass):** N 38° 00′ - E 44° 55′, 1860 m, 48 km NW Urmia; **Band:** N 37° 30′ - E 45° 00′, 1400 m, 1.5 km SW Urmia; **Kelïsä Kandï:** N 37° 29′ - E 45° 01′, 1600 m, 2.5 km SW Urmia; **Shïrü Kandï (Qasemlü valley):** N 37° 18′ - E45° 07′, 1420 m, 29 km SE Urmia; **Towlakï:** N 37° 31′ - E 47° 44′, 1750 m, 25 km SW Urmia.

The identifications of all tephritid specimens were made possible by B. Merz (Geneva). The host plants were identified by comparison with voucher specimens from the Herbariums of Research Center of Natural Resources of Azarbaijan-e Gharbi and Department of Plant Science, Faculty of Science, Urmia University. General distribution of the species was taken from Merz & Korneyev (2004). The specimens are deposited in the collections of Natural History Museum of Urmia University and some specimens are housed in the insect collection of the Natural History Museum, Geneva.

Results

During the four years of survey, a total of 269 of tephritid-infested flowerheads belonging to 10 genera and 17 species of Asteraceae plants were collected and watched

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intently in the laboratory. The reared tephritids belong to eight genera and 20 species within the subfamily Tephritinae. New host plant records are marked with an asterisk (*).

***Acanthiophilus helianthi* (Rossi, 1794)**

Material examined – 35 ♀♀, 26 ♂♂, ex *Cnicus benedictus* L.*, 8-16.VII.2006, vicinity of Täzehkand-e Qäterchï village; 9 ♀♀, 7 ♂♂, ex *Serratula coriacea* Fisch. & Mey. ex DC.* , 5-17.VIII.2006, vicinity of Band village; 5 ♀♀, 3 ♂♂, ex *Serratula coriacea*, 3-18.VIII.2006, vicinity of Alïkän village (Qüshchï pass); 4 ♀♀, 3 ♂♂, ex *Centaurea behen* L.*, 5-14.VIII.2006, vicinity of Shïrü Kandï (Qasemlü valley); 4 ♀♀, 6 ♂♂, ex *Centaurea behen*, 8-15.V.2008, vicinity of Kelïsä Kandï.

Host plants – *Acroptilon* spp., *Carduus argentatus* L., *Card. nutans* L., *Carthamus tinctorius* L., *Cart. glaucus* M. Bieb., *Cart. tenuis* L., *Cart. syriacum* (Boiss.), *Centaurea iberica* Trev. ex Spreng, *Cent. pallescens* Delile, *Cent. procurrens* Sieb., *Cent. nigra* L., *Cent. calcitrapa* L., *Cent. solstitialis* L., *Cent. scabiosa* L., *Cent. stoebe* L., *Cent. jacea* L., *Cent. Cyanus* L., *Cent. cheiracantha* Boiss., *Cirsium arvense* (L.) Scop, *Cirs. vulgare* (Savi) Ten., *Scolymus hispanicus* L., *Serratula* spp. (Giray 1979; White, 1988; Freidberg & Kugler, 1989; Merz, 1994). *Acanthiophilus helianthi* is a generalist and attacks almost every species of the tribe Cardueae. It was reared from about 50 species of the tribe Cardueae and is a known pest of safflower (White & Elson-Harris, 1992).

Distribution – Europe (except north), Transcaucasia, Turkey, Iran, Iraq, Lebanon, Mongolia, Central Asia, East Palaearctic, North Africa and Oriental region.

***Campiglossa producta* (Loew, 1844)**

Material examined – 4 ♀♀, 3 ♂♂, ex *Picris strigosa* Bieb, 2-12.IX.2007, vicinity of Band village.

Host plants – *Bellis silvestris* Cyr., *Chondrilla juncea* L., *Picris strigosa* (Freidberg & Kugler, 1989) *Sonchus* spp. (Korneyev, 2003), *Hypochoeris glabra* L., *Leontodon taraxacoides* (Vill.) Merat. (Smit, 2006).

Distribution – Europe, East Palaearctic and Near East.

Remarks – This species was previously treated in the genus *Paroxyna* Hendel (White, 1988).

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***Chaetorellia conjuncta* (Becker, 1913)**

Material examined – 2 ♀♀, 8 ♂♂, ex *Centaurea calcitrapa* L.*, 11-20.V.2005, 1 ♀, 12.V.2008, vicinity of Täzehkand-e Qäterchï village.

Host plants – *Carthamus tenuis*, *Centaurea iberica*, *Cent. iberica* var. *meryonis* (Knio *et al*., 2002).

Distribution – Albania, European Turkey, Greece, Hungary, East Palaearctic, Near East, North Africa and Oriental region.

***Chaetostomella cylindrica* (Robineau-Desvoidy, 1830)**

Material examined – 3 ♀♀, 2 ♂♂, ex *Centaurea behen* L.*, 4-15.VIII.2005, vicinity of Shïrü Kandï village (Qasemlü valley).

Host plants – *Arctium tomentosum* L., *Carduus argentatus*, *Card. crispus* L., *Card. nutans* L., *Carthamus tenuis* (Boiss.) Bornm., *Centaurea bracteata* L., *Cent. cheiracantha*, *Cent. cyanus* L., *Cent. diacantha*, *Cent. iberica* Trev. ex Spreng, *Cent. jacea* L., *Cent. maculusa* L., *Cent. montana* L., *Cent. nervosa* L., *Cent. nigra* L., *Cent. nigrescens* L., *Cent. scabiosa* L., *Cent. solstitialis* L., *Cent. triumfetti* L., *Cirsium acaulae* L., *Cirs. arvense*, *Cirs. eriophorum* (L.) Scop., *Cirs. eristhales* (L.) Scop., *Cirs. gaillardotii* L., *Cirs. oleraceum* (L.) Scop., *Cirs. palustre* (L.) Scop., *Cirs. rivulare* (L.) Scop., *Cirs. tuberosum* (L.) All., *Cirs. vulgare*, *Cousinia hermonis* L., *Crupina vulgaris* L., *Echinops viscosus* DC, *Jurinea mollis* Boiss. et Hausskn., *Notobasis syriaca*, *Onopordum acanthium* L., *Onopordum cynarocephalum* Boiss. et Bl., *O. floccosum* L., *Picnomon acarna* L., *Serratula tinctoria* L., *Silybum marianum*, (White, 1988; Freidberg & Kugler, 1989; Merz, 1994; Knio *et al*., 2002; Kütük & Özgür, 2003). Knio *et al*. (2002) noted that *C. cylindrica* is the second highly oligophagous species associated with Lebanese thistles. It was reared from seven genera and eight species of the Cardueae.

Distribution – Europe, East Palaearctic, Near East and North Africa.

***Orellia stictica* (Gmelin, 1790)**

Material examined – 8 ♀♀, 7 ♂♂, ex *Tragopagon buphthalmoides* L.*, 11-25.VIII.2007, vicinity of Täzehkand-e Qäterchï village.

Host plants – Various species of *Tragopagon*, rarely *Scorzonera* spp., occasionally *Taraxacum serotinum* (Waldst. et Kit.) Fisch. (Korneyev, 1987; Merz, 1994; Korneyev, 2003; Kütük & Özgür, 2003).

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Distribution – Austria, Bulgaria, Czech Republic, France, Germany, Hungary, Romania, Sweden, Ukraine and Near East.

Remarks – This species is listed under *Orellia punctata* (Schrank) as a synonym (Merz, 1994).

***Tephritis acanthiophilopsis* Hering, 1938**

Material examined – 21 ♀♀, 19 ♂♂, ex *Cirsium congestum* Fisch. et C.A. Mey.*, 11-18.VIII.2006, vicinity of Towlakï village.

Host plants – *Circium canum* (L.) All. (Merz, 1994).

Distribution – Czech Republic, Hungary, Italy, Romania, Slovakia and Near East.

***Tephritis hurvitzi* Freidberg, 1981**

Material examined – 4 ♀♀, 3 ♂♂, ex *Tragopogon graminifolium* DC.*, 4-12.VIII.2007, vicinity of Band village.

Host plants – *Scorzonera syriaca* Boiss. & Bl., *Tragopogon longirostris* Bischoff ex Sch.Bip. (Freidberg & Kugler, 1989).

Distribution – Cyprus, Greece, East Palaearctic and Near East.

***Tephritis postica* (Loew, 1844)**

Material examined – 4 ♀♀, 3 ♂♂, ex *Onopordum acanthium* and *O. leptolepis* D.C.*, 8-14.V.2005, 8 ♀♀, 9 ♂♂, ex *O. acanthium* and *O. leptolepis*, 1-9.VIII.2005, vicinity of Täzehkand-e Qäterchï and Shïrü Kandï village (Qasemlü valley).

Host plants – *Onopordum acanthium*, *O. cynarocephalum* Boiss. and *O. floccosum* (Freidberg & Kugler, 1989; Merz, 1994; Knio *et al*., 2002).

Distribution – Albania, Austria, Greece, Cyprus, Czech Republic, Germany, Greece, Hungary, Italy, Moldova, Poland, Romania, Italy, Spain, Ukraine, East Palaearctic, Near East and North Africa (excluding Sinai Peninsula).

***Terellia colon* (Meigen, 1826)**

Material examined – 2 ♀♀, 3 ♂♂, ex *Centaurea cyanus* L.*, 9-18.V.2005, vicinity of Täzehkand-e Qäterchï village.

Host plants – *Onopordum illyricum*, *Silybum marianum* (L.) (Knio *et al*., 2002), *Centaurea scabiosa* L. (Koprodova & Martinkova, 2006; Korneyev, 2008). *Terellia colon* has

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been recorded from *Carlina* spp., *Carthamus* spp., *Centaurea* spp. and *Galactites* spp. (Neuenschwander & Freidberg, 1983; Freidberg & Kugler, 1989; Merz, 1994).

Distribution – Europe, East Palaearctic and Near East.

***Terellia gynaecochroma* (Hering, 1937)**

Material examined – 6 ♀♀, 5 ♂♂, ex *Onopordum acanthium* L., 12-18.V.2006, 8 ♀♀, 4 ♂♂, ex *O. acanthium*, 9-17.VIII.2006, vicinity of Shïrü Kandï village (Qasemlü valley).

Host plants – *Onopordum anisacanthum* Boiss. and *O. illyricum* L., *Onopordum* spp. (Knio *et al*., 2002; Korneyev, 2003).

Distribution – Central and South Europe, Near East.

Remarks – This species was formerly treated under *Terellia lappae* (Cederhjelm).

***Terellia ruficauda* (Fabricius, 1794)**

Material examined – 4 ♀♀, 3 ♂♂, ex *Cirsium arvense* (L.) Scop., 9-18.V.2005, vicinity of Täzehkand-e Qäterchï and Kelïsä Kandï village.

Host plants – *Cirsium arvense*, *Cir.eriophorum* (L.) Scop. and *Cir. palustre* (L.) Scop. (White, 1988; Merz, 1994; Kütük & Özgür, 2003).

Distribution – Europe, East Palaearctic, Near East and Nearctic region.

Remarks – This species was introduced into the United States of America for the biological control of *Cirsium arvense* (Larson *et al*., 2005).

***Terellia serratulae* (Linnaeus, 1758)**

Material examined – 17 ♀♀, 15 ♂♂, ex *Cirsium vulgare* (Ten.) Savi, 9-18.V.2005, vicinity of Täzehkand-e Qäterchï and Kelïsä Kandï village.

Host plants – *Arctium* spp., *Carduus acanthoides* L., *Card. argentatus*, *Card. defloratus* L., *Card. nutans* L., *Card. pycnocephalus* L., *Cirsium acarna*, *Cirs. alatum* (Gmel.) Bobr., *Cirs. amani*, *Cirs. erisithales* (Jacq.) Scop., *Cirs. libanoticum*, *Cirs. oleraceum* (L.) Scop., *Cirs. phyllocephalum* Bois. et Blanche, *Cirs. tuberosum* (L.), *Cirs. vulgagre*, *Galactites tomentosa* Moench, and *Lamyropsis cynaroides* (Lam.) Dittrich (Zwölfer, 1965; Kugler & Freidberg, 1975; Neuenschwander & Freidberg, 1983; White, 1988; Merz, 1994; Knio *et al*., 2002; Baugnee, 2006).

Distribution – Europe, East Palaearctic, Near East and North Africa (excluding Sinai Peninsula).

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***Terellia uncinata* White, 1989**

Material examined – 5 ♀♀, 3 ♂♂, ex *Centaurea solstitialis* L., 9-18.V.2005, vicinity of Shïrü Kandï village (Qasemlü valley).

Host plants – *T. uncinata* is currently only known from the yellow starthistle (*Centaurea solstitialis*) in Italy, Greece and Turkey, and from two closely related plants *Centaurea nicaeensis* All. in Italy and probably *Centaurea idaea* Boiss. & Heldr. in Crete (White, 1989).

Distribution – Albania, Bulgaria, European Turkey, Greece, Italy, Turkey and Near East.

***Urophora aprica* (Fallen, 1814)**

Material examined – 1 ♀, 2 ♂♂, ex *Centaurea cyanus*, 8-14.V.2005, vicinity of Täzehkand-e Qäterchï.

Host plants – *Centaurea cyanus*, *C. iberica* and *C. solstitialis* (Merz, 1994; Kütük, 2003).

Distribution – Austria, Belgium, Bulgaria, Czech Republic, Finland, Hungary, Italy, Lithuania, Poland, Russia, Slovakia, Sweden, Switzerland, Ukraine and Near East.

***Urophora pauperata* (Zaitzev, 1954)**

Material examined – 3 ♀♀, 14 ♂♂, ex *Centaurea calcitarapa* L.*, 11-28.IV.2006, 4 ♀♀, 2 ♂♂, ex *C. calcitarapa*, 14-27.IV.2008, vicinity of Täzehkand-e Qäterchï village.

Host plants – *Centaurea iberica* (Knio *et al.*, 2002).

Distribution – Albania, European Turkey, East Palaearctic, Near East and Georgia.

Remarks – White & Korneyev (1989) described *Urophora affinis calcitrapae*, which was later considered as a junior synonym of *U. pauperata* (Korneyev & White, 1996).

***Urophora quadrifasciata sjumorum* (Rohdendorf, 1937)**

Material examined – 21 ♀♀, 17 ♂♂, ex *Centaurea calcitrapa* L.*, 11-18.IV.2006, 6 ♀♀, 14 ♂♂, ex *C. calcitrapa*, 13-27.IV.2007, 9 ♀♀, 11 ♂♂, ex *C. calcitrapa* 15-29.IV.2008, 16 ♀♀, 13 ♂♂, ex *Acroptylon repens* (L.) DC.*, 10-18.IV.2006, 11 ♀♀, 8 ♂♂, ex *A. repens* 2-11.IV.2007, vicinity of Täzehkand-e Qäterchï village.

Host plants – *Carthamus tenuis*, *C. eryngioides*, *Centaurea iberica*, *C. pallescens*, (Knio *et al*., 2002).

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Distribution – Cyprus, European Turkey, East Palaearctic, Near East and Oriental region.

***Urophora sirunaseva* (Hering, 1938)**

Material examined – 10 ♀♀, 7 ♂♂, ex *Centaurea solstitialis*, 8-18.V.2005, vicinity of Shïrü Kandï village (Qasemlü valley).

Host plants – This species is only known from *Centaurea solstitialis* and the closely related *C. idaea*. It was successfully introduced from Greece and established on yellow starthistle in the United States (Turner *et al*., 1994). Host records for this fly include *C. solstitialis* from north-eastern Greece, Turkey, Moldavia and Ukraine, and the closely related *C. idaea* from north-eastern Crete (White & Korneyev, 1989). Field tests (Clement & Sobhian, 1991; Sobhian, 1993) and glasshouse tests (Turner, 1994) showed that the fly is highly host-specific.

Distribution – European Turkey, Greece, Hungary, Moldova, Ukraine and Nearctic region.

***Urophora solstitialis* (Linnaeus, 1758)**

Material examined – 18 ♀♀, 30 ♂♂, ex *Cirsium vulgare*, 11-18.V.2005, 3 ♀♀, 10 ♂♂, ex *Cir. vulgare*, 14-22.V.2008, vicinity of Täzehkand-e Qäterchï village.

Host plants – *Carduus acanthoides* L., *Car. crispus* L., *Car.defloratus* L., *Car. nutans* L., *Car. personata* (L.) Jacq., *Cirsium heterophyllum* (L.) Hill. and *Cir. vulgare.* (White, 1988; Merz, 1994).

Distribution – Europe, Australasian region, East Palaearctic, Near East, Nearctic region and North Africa (excluding Sinai Peninsula).

Remarks – This species was introduced into North America, Australia, and New Zealand for biological control of *Cirsium vulgare* (Norrbom *et al*., 1999).

***Urophora stylata* (Fabricius, 1775)**

Material examined – 2 ♀♀, 1 ♂, ex *Arctium lappa* L.*, 9-18.V.2005, vicinity of Shïrü Kandï village (Qasemlü valley).

Host plants – *Centaurea iberica*, *Cirsium phyllocephalum*, *Echinops viscosus*, *Galactites* spp., *Notobasis syriaca*, and *Onopordon illyricum* (Neuenschwander & Freidberg, 1983; White, 1988; White & Korneyev, 1989; Knio *et al*., 2002).

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Distribution – Europe, Russia (except Russia North West), Australasian region, East Palaearctic, Near East, Nearctic and Oriental regions.

***Urophora xanthippe* (Munro, 1934)**

Material examined – 17 ♀♀, 26 ♂♂, ex *Acroptylon repens*, 19-26.IV.2006, 6 ♀♀, 6 ♂♂, 14-21.V.2008, vicinity of Täzehkand-e Qäterchï village.

Host plants – *Acroptilon picris* (Pall.) C. A. M. (Kameneva & Korneyev, 1987) and *A. repens* (L.) DC. (Korneyev & White, 1993).

Distribution – Ukraine, Middle and East Palaearctic and Oriental regions.

Remarks – It is first recorded from Iran.

Discussion

This study is a contribution to the Iranian Tephritinae (Dip.: Tephritidae) fauna and their associated host plants in Urmia region. Gilasian (2007) has reported the occurrence of *A. helianthi*, *C. producta*, *T. serratulae* and *U. aprica* in Urmia region without any data on their host plants. The existence of 20 species of tephritid flies in only Urmia region indicates the high diversity of these flies in Iran. The host plants of some species are among the most noxious weeds in Urmia region and other countries. Regarding to pre-dispersal seed predation by seed head infesting fruit flies they have important role in suppression of weeds as biological control agents. The overwintering species in the seedheads, spend the winter as larvae and emerge as adult in the next spring. Recording of 13 new host plant species shows that these flies might attack other unknown host plants in the region as well. Although fruit flies are commonly viewed as pests, some species are valuable agents for the biological control of weeds (White & Elson-Harris 1992; Turner 1996). Nearly most of species that have been tested or used in biological control belong to the subfamily Tephritinae and attack the Asteraceae. White & Elson-Harris (1992) provided comprehensive lists of species that are released or considered as the agent of biological control. Turner (1996) listed the most successful cases of the weed control by fruit flies. Some species of *Urophora* such as *U. affinis*, *U. cardui*, *U. quadrifasciata*, *U. sirunaseva*, *U. solstitialis* and *U. stylata* which are native to Palaearctic region have been introduced to North America for weed biocontrol (Turner *et al*., 1994; Turner, 1996; Wheeler & Stoops, 1996). *U. terebrans* was released in Australia, and *U. solstitialis* and *U. stylata* has been introduced there and in New Zealand for weed biocontrol (Woodburn, 1993; Turner, 1996). The release of *U. stylata* in South Africa

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was not successful (Freidberg & Mansell, 1995), but it has been reported from India (Kapoor, 1993). *U. quadrifasciata* was introduced to Australia accidentally (White & Elson-Harris, 1992). In order to biological control of Russian knapweed, *U. kasachstanica* and *U. Xanthippe* are being studied for release in the western United States (Littlefield *et al*., 2003). Recently, *Terellia virens* (Loew) and *T. ruficauda*, which are native to the Palaearctic region, were introduced to North America successfully for weed biological control (Turner, 1996).

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