Revision of the *Urophora xanthippe* species group, with description of new species (Diptera: Tephritidae)

SAEED MOHAMADZADE NAMIN¹ & JAMASB NOZARI²

¹Department of Plant Protection, Faculty of Agriculture, Varamin-Pishva branch, Islamic Azad University, Varamin — Iran. E-mail: mohamadzade@iauvaramin.ac.ir
²Department of Plant Protection, Faculty of Agriculture, University of Tehran, Karaj, Iran. E-mail: nozari@ut.ac.ir

Abstract


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Introduction

The genus *Urophora* Robineau-Desvoidy 1830, with 61 species, is one of the largest genera of the family Tephritidae in the Palaearctic Region (Norrbom et al. 1999; Norrbom 2004). All species of known biology are associated with asteraceous plants and most of them induce galls in their flower heads or stems (White & Korneyev 1989).

Some *Urophora* species are biological control agents of asteraceous weeds; of them, *U. affinis* Frauenfeld 1857, *U. quadrijasciata* (Meigen 1826), *U. cardui* (Linnaeus 1758), *U. sylata* (Fabricius 1794), *U. sirunaseva* (Hering 1938), and *U. solstitialis* (Linnaeus 1758) have been successfully introduced into the Nearctic Region for biocontrol of weeds (Peschken & Harris 1975; Turner et al. 1994; Turner 1996; Wheeler & Stoops 1996).

In the Palaearctic Region, a key to species of *Urophora* was provided by Korneyev & White (1999). Since then a few additional species were described: *Urophora chakassica* Shcherbakov, *U. doganlari* Kütük, *U. iani* Kütük, *U. turkeyensis* Yaran & Kütük and *U. merzi* Mohamadzade Namin from Turkey and Iran (Shcherbakov 2001; Kütük 2006; 2009; Mohamadzade Namin & Nozari 2011; Yaran & Kütük 2014). Phylogenetic relationships within *Urophora* were analyzed by Korneyev (Korneyev et al. 2005).

The *xanthippe* species group was established by Korneyev & White (1993) to include species of *Urophora* with the margin of the scutum adjacent to the postpronotal lobe and notopleuron yellow: *U. impicta* Hering 1942, *U. kasachstanica* (Richter 1964), *U. stalker* Korneyev 1984, *U. xanthippe* (Munro 1934), and 2 undescribed species; also, *U. beikoi* Korneyev 1985 was suggested to be a junior synonym of *U. stalker*. Later, one of the two unnamed species was described as *U. iani* Korneyev & Merz 1998. In the key to Palaearctic *Urophora* (Korneyev & White 1999), species of the group with and without wing pattern were keyed separately; *U. hermonis* Freidberg 1974 was added to the key as similar to *U. impicta*.

Most of the species assigned to this group were hitherto known only from the Middle East and Central Asia, from Israel and Armenia to Kyrgyzstan and Tadjikistan, except *U. kasachstanica* and *U. xanthippe*, which are recorded also from southern Ukraine and associated with the invasive weed *Acr ropitlon repens* (L.) DC., apparently introduced from Kazakhstan (Korneyev & Kameneva 1984).

During studies on the tephritid fly fauna of Iran, two previously undescribed species superficially similar to *Urophora xanthippe* were discovered. To clarify the taxonomy and distribution of the species assigned to the *xanthippe* species group, all available material including newly collected specimens from Iran was revised.
Material and methods

Adult flies were collected by standard net sweeping or reared from flowerheads of host plants.

The material listed below is deposited in collections of the following institutions:

JAZM  Jalal Afashar Zoological Museum, College of Agriculture, University of Tehran, Karaj, Iran.
MHNG  Museum d’histoire naturelle, Genève, Switzerland.
SIZK  I. I. Schmalhausen Institute of Zoology, National Academy of Sciences of Ukraine, Kiev, Ukraine.
SMNC  Author’s private collection.
ZISP  Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia.

According to White & Korneyev (1989), the characters most useful for diagnosis of closely related species of *Urophora* are the wing pattern details, wing length (WL), aculeus length (AL), shape of aculeus apex, and ratio of aculeus length to wing length (AL/WL). Most of the species of *Urophora xanthippe* group are recognizable by the shape of aculeus apex and distance between apices of the aculeus preapical steps to the aculeus tip (Fig. 5).

Taxonomy

**Genus Urophora** Robineau-Desvoidy 1830

Robineau-Desvoidy 1830: 769.
Type species: *Musca cardui* Linnaeus 1758 by designation of Westwood (1840).

**Diagnosis.** The most comprehensive concept of the genus and its detailed diagnosis were proposed by Freidberg & Norrbom (1999: 610), and are not repeated here.

Freidberg & Norrbom (1999) listed 57 species occurring almost exclusively in the Palaearctic Region, with one species described from Taiwan and several species introduced to North America and Australia as weed biocontrol agents. The same year, Korneyev & White (1999) reconsidered some synonymies. Later, Kütük (2006, 2009) and Mohamadzade Namin & Nozari (2011) described three additional species from Turkey and Iran. Before this study, 61 valid nominal species were recognized in the genus *Urophora*.

**Urophora xanthippe** species group

**Diagnosis.** Antenna yellow and rounded apicodorsally; palp yellow, unmodified; mesonotal scutum densely gray microtrichose, its anterolateral margin yellow, concolorous with postpronotal lobe and notopleuron bordering it. Wing either with brown bands (in *U. kasachstanica* and *U. stalker*) or hyaline with yellowish pterostigma and apically darkened veins. Aculeus with more or less distinct steps.

Occasional specimens *U. terebrans* (Loew 1850) have the anterolateral margin of the mesonotum yellow (in most of the specimens is black), although it is conspicuously narrower than in the species of the *xanthippe* group. To prevent possible confusion, that species is also included in the key.

**Description.** **Head** slightly higher than long, Yellowish to brownish, except occiput, ocellar tubercle, and slender part of arista black. Antenna yellow, scape with blackish setulae at dorso-apical margin; first flagellomere yellow, about 2 times as long as wide and distinctly rounded apicodorsally; arista bare. Gena as high as length of first flagellomere. Ocellar, vertical, orbital, frontal and genal setae black and acuminate; two frontal and one orbital setae present. Ocellar seta as long as frontal setae. Frons with black setulae around frontal setae. Labellum moderately long with black setulae.

**Thorax.** General color black; scutum densely gray microtrichose and black setulose. Thoracic pleura black;
postpronotal lobe, dorsal margin of anepisternum, notopleuron and also part of scutum bordering them yellow. Dorsocentral setae usually situated at or slightly anterior of line between supra-alar setae. Scutellum mostly yellow; slightly convex, corners black; with 4 equally long black setae, basal setae inserted in yellow area. Subscutellum and mediostigmate black. All setae on thorax black. Halter yellow.

**Legs.** Completely yellow, or in some species fore femur striped black dorsally; and in cold morph of *U. impicta* basal part of all femora black; all setae and setulae blackish.

**Wing.** In most species entirely hyaline, except pterostigma yellowish and distal parts of costa and veins R<sub>2+3</sub> and R<sub>4+5</sub> M black; only *U. stalkeri* and *U. kasachstanica* have 3–4 crossbands. Vein R<sub>4+5</sub> without setulae ventrally or dorsally. Cell bcu without short postero-distal lobe.

**Abdomen.** General color black; covered with sparse gray microtrichia and black setulae. Posterior margin of abdominal tergites 5–6 in female with long black setae. Oviscape shiny black with black setulae, length of oviscape about two times as long as preabdomen. Aculeus narrow and brown. Tergite 5 of males about as long as 2–3 preceding tergites, and with long setae on posterior margin. Male terminalia in most species uniform. Epandrium rounded in caudal view, posterior lobe of lateral surstylus very weakly produced. Phallus elongate and weakly sclerotized in middle.

### Key to the species of the *xanthippe* group

1. Scutum at margins of postpronotal lobe and notopleuron yellow. .................................................. 2.
   - Scutum at margins of postpronotal lobe and notopleuron black. .............................................. other *Urophora* species
2. Apical section of vein M at least 1.8 (1.8–2.8) times as long as preapical section, apex of aculeus with two pairs of distinct steps. Wing with 3–4 brownish crossbands. Associated with *Onopordum* spp. and *Cirsium* sp. ........... *U. terebrans* Loew
   - Apical section of M no more than 1.8 (1.1–1.8) times as long as preapical section; apex of aculeus variable. Wing with or without crossbands. Associated with *Cousinia*, *Acroptilon*, and *Onopordum* spp. (*Urophora xanthippe* species group). ........ 3.
3. Wing with 3–4 brownish crossbands (Figs. 30, 37). ................................................................. 4.
   - Wing pattern reduced, without brown crossbands (Figs. 1, 10, 21, 25, 41). ................................... 5.
4. Apical and preapical bands separated; subbasal crossband completely lacking; preapical crossband extends from anterior to posterior margin. Aculeus with two pairs of distinct preapical steps (Fig. 34). Smaller: WL♀ < 3.8, AL < 2.9. Associated with *Acroptilon repens* .............................................. *U. kasachstanica* Richter
   - Apical and preapical crossbands connected on anterior margin (if separated, subbasal crossband developed, or preapical band expressed only around dm-cu). Aculeus with distinct proximal and diminished distal steps (Fig. 39). Larger: WL♀ > 4, AL > 2.7. Associated with *Cousinia* ................................................................. *U. stalkeri* Korneyev
5. Larger: WL♀ > 4mm, if WL♀ < 4mm then AL > 3mm. ................................................................. 6.
   - Smaller: WL♀ < 3.8mm, AL < 2.5mm. ......................................................................................... 9.
6. All femora black basally; if femora yellow then aculeus with 1 pair of proximal steps; distance between steps 1.3–1.5 times as long as the distance from their level to aculeus apex (Fig. 29). Associated with *Cousinia* spp. ........ *U. impicta* (Hering)
   - Femora yellow, at most only fore femur striped black dorsally; aculeus with both proximal and distal steps; distance between steps as long as the distance from their level to aculeus apex or shorter (Figs. 5, 13). .................................................. 7.
7. AL < 3.4 mm, distance between apices at level of proximal steps clearly greater than that from their level to aculeus apex. With deep notch at apex (Fig. 5). Associated with *Cousinia archibaldii* Rech. ........................................... *U. bakhitari* sp. nov.
   - AL > 3.4 mm, distance between apices at level of proximal steps almost equal to distance from their level to aculeus apex. 8.
8. AL/WL < 0.85, width of aculeus at level of proximal steps >1.75 times as long as distance between proximal and distal steps (Fig. 13). Associated with *Onopordum acanthium*. ........................................................................... *U. dirlbeiki* sp. nov.
   - AL/WL > 0.85, width of aculeus at level of proximal steps <1.75 times as long as distance between proximal and distal steps. Associated with *Acroptilon repens* and *Cousinia* sp. ........................................... *U. sp* near *dirlbeiki*
9. Aculeus with 1 pair of prominent proximal steps, distance between their apices at level of proximal steps smaller than that from their level to aculeus apex (Fig. 45). Associated with *Acroptilon repens*. ........................................ *U. xanthippe* (Munro)
   - Aculeus with distinct proximal and indistinct distal steps, distance between their apices at level of proximal steps greater than that from their level to aculeus apex (Fig. 23). Associated with *Cousinia mollis* ................. *U. iani* Korneyev & Merz

### *Urophora bakhtiari* Mohamadzade sp. nov.

(Figs. 1–9)

**Type material.** Holotype (female): Iran: Charmahal & Bakhtiari Province, south part of Choghakhor Lake, 2600m, 31°53’ N, 50°58’ E, swept from flower heads of *Cousinia archibaldii*, 08.vi.2013, Mohamadzade (JAZM).

Paratypes: Iran: 20♂, 17♀, same collection data as holotype; 7♂, 6♀, Charmahal & Bakhtiari Province, south part
of Choghakhor Lake, 2600m, 31°52' N, 50°57' E, swept from flower heads of *Cousinia archibaldii*, 28.v.2014, Mohamadzade (JAZM, MHNG, SIZK, ZISP and SMNC); Fars Province, Mah Parviz pass, 60 km to Yasuj, 2600m, 31°52' N, 50°57' E, 26.v.2014, V. Korneyev (SMNC). *Armenia*: 1♀, Vedi, 25.vi.1981, Ermolenko (SIZK).

**Diagnosis.** *U. bakhtiari* is similar to *U. iani* and *U. xanthippe* in having smaller body size and shorter wings (♀WL <4mm), strongly reduced wing pattern and yellow femora. It differs only by the shape of the aculeus tip, which has two pairs of distinct preapical steps (*U. xanthippe* has one pair of distinct steps; *U. iani* has distinct proximal steps and indistinct distal steps), and also has a different host plant.

**Description.**

**Head.** Length: height: width ratio = 1: 1.15: 1.42. First flagellomere 1.6 times as long as wide (Fig. 3). Compound eye 1.15 times as high as long. Gena as high as length of first flagellomere. **Wing** Entirely hyaline, without crossbands. Distal part of costal vein black. Pterostigma yellowish. Distance between crossveins as long as dm-cu crossvein (Fig. 1).

**Legs** completely yellow (Fig. 1).

**Terminalia.** Aculeus apex with 2 pairs of distinct preapical steps; distance between their apices at the level of proximal steps greater than that from their level to aculeus apex and also with notch at apex, as in Figs. 4 & 5. Epandrium and glans as in Figs. 6–8, very similar to those in *Urophora cardui* (Linnaeus 1758) (see Freidberg & Norrbom 1999: fig. 23.7 L) and *U. stylata* (Fabricius 1775) (see Freidberg & Kugler 1989: Fig. 48).

**Measurements.** Holotype ♀: BL = 6.25, WL = 3.6; ♂: BL = 2.9–4.25mm (average 3.7), WL = 2.6–3.6 mm (average 3.3); ♀: BL = 5.5–6.5mm (average 6.2) WL = 3.5–4.2mm (average 3.7) (n = 10), AL = 3.1–3.3 mm (average 3.2), AL/WL = 0.75–0.83 (average 0.79) (n = 5).

**Etymology.** This species is named after the Bakhtiari tribe (a southwestern Lurish tribe) that live in the type locality of the new species.

**Host plant.** *Cousinia archibaldii* Rech., from which adults were collected, is probably a host for this species, but this needs to be confirmed by rearing.

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**Urophora dirlbeki** Mohamadzade sp. nov.

(Figs. 10–18)

Korneyev & White 1993: *Urophora* sp. 2.

**Type material.** Holotype ♀: Iran: Yazd Province, Taft, Sanich, 2600 m, 31°34.715' N, 54°01.256' E, swept from flowerheads of *Onopordum acanthium* L., 06.v.2010, Mohamadzade (JAZM).

Paratypes: Iran: 9♂, 2♀, same collection data as holotype; 24♂, 9♀, Yazd Province, Khezrabad, 1670m, 31°52.688' N, 54°57.412' E, reared from flowerheads of *O. acanthium*, collected: 06.v.2010, emerged: 27.v.2010; 10♂, 2♀, Yazd Province, Taft, Tezerjoon, 2150m, 31°38.134' N, 54°10.017' E, 23.iv.2010; 13♂, 14♀, Yazd Province, Taft, Deh bala, 2600 m, 31°33.475' N, 54°07.139' E, 23.iv.2010; Mohamadzade (JAZM; some paratypes are deposited in MHNG, SIZK, ZISP and SMNC).

**Diagnosis.** *U. dirlbeki* is a moderately large fly, with strongly reduced wing pattern and yellow femora, similar to *U. impicta*. It differs by the shape of the aculeus apex, which has two pairs of distinct preapical steps (*U. impicta* has one pair of preapical steps and the apex shorter) and also has a different host plant. The length and shape of the aculeus tip are similar in *U. dirlbeki* and *U. terebrans*, but the latter species has banded wings and narrower yellow margins on the scutum. The two latter species also share the same host plant species.

**Description.**

**Head.** Length: height: width ratio = 1: 1.15: 1.45. First flagellomere yellow, twice as long as wide. Compound eye 1.2 times as high as long. Gena as high as length of first flagellomere. **Wing** hyaline. Distance between crossveins r-m and dm-cu 1.3 times as long as crossvein dm-cu (Fig. 10).

**Legs** yellow, only fore femur with black stripe posterodorsally (Fig. 10). **Terminalia.** Aculeus apex with 2 pairs of distinct preapical steps; distance between their apices at the level of proximal steps greater than that from their level to aculeus apex and also with notch at apex, as in Figs. 12 & 13. Epandrium and lateral surstylus rounded in posterior view and glans long and slender and poorly sclerotized (Figs. 16–18).

**Measurements.** Holotype ♀: BL = 9.5, WL = 5.2; ♂: BL = 4–4.9mm (average 4.6), WL = 3.7–4.9 mm (average 4.3); ♀: BL = 8.2–6.3mm (average 8.8) WL = 4.5–5.3mm (average 4.9), (n=10), AL = 3.4–4.5 mm (average 3.9), AL/WL = 0.75–0.85 (average 0.8) (n = 5).

**Etymology.** This species is named in honor of Dr. Jan Dirlbek, Czech dipterist, in recognition of his contribution to the study of Middle Eastern Tephritidae.

**Host plant.** Adults were reared from capitulae of *Onopordum acanthium* L.
**Urophora sp. near dirlbeki**

**Material examined**: Iran: 10♂, 4♀, Khorasan Razavi Province, Binalood, 10 km NW Dizbad, 2400m, 36°06' N, 59°14' E, reared from flowerheads of *Acroptilon repens*, collected: 15.vii.2011, emerged: 18–27.vii.2011, Mohamadzade; 2♂, 2♀, Khorasan Razavi Province, Binalood, 10 km NW Dizbad, 2400m, 36°06' N, 59°14' E, reared from flower heads of *Cousinia* sp., collected: 15.vii.2011, emerged: 25.vii.2011, Mohamadzade; 2♀, Mazandaran Province, Rineh, southern mountainside of Damavand, 2150m, 35°52' N, 52°06' E, 27.vi.2013, Mohamadzade; 2♂, 1♀, Fars Province, Dasht Arjan, Nasimabad 2050m, 29°41' N, 52°04' E, 25.iv.2014, Mohamadzade (SIZK and SMNC).

**Measurements**. ♂: BL = 3.7–4.2mm (average 3.9), WL = 3.25–3.9 mm (average 3.5) (n=10); ♀: BL = 7.3–8mm (average 7.7) WL = 4–4.5mm (average 4.2), AL = 3.7–4.5 mm (average 4), AL/WL = 0.85–1 (average 0.94) (n = 5).

**Discussion**. *Urophora* sp. near *dirlbeki* is a moderately large fly similar to *U. dirlbeki* in having a strongly reduced wing pattern, yellow femora, and shape of aculeus apex, but differing in size and associated with different host plant. Head width/head length ratio is 1.37 but in *U. dirlbeki* is 1.45. Ratio of aculeus length/wing length (AL/WL) is 0.94 instead 0.8 in *U. dirlbeki*. The width of aculeus at the level of proximal steps 1.65 times as long as distance between proximal and distal steps (1.85 in *U. dirlbeki*). It is possible that these specimens are either conspecific, representing different host plant races, or even separate species, but further studies are needed.

**Urophora iani** Korneyev & Merz 1998
(Figs. 19–24)


**Diagnosis**. A comparatively small fly, with strongly reduced wing pattern and yellow femora, similar to *U. bakhtiari* (in size, aculeus tip with two pairs of indistinct preapical steps, and host plant of the genus *Cousinia*), differing by the conspicuously shorter aculeus (AL=2.1 mm vs. 3.2 mm, and AL/WL=0.6 vs. 0.8). This species also strongly resembles *U. xanthippe* in body and aculeus size, and hyaline wing, differing only in having aculeus tip with two pairs of indistinct steps (in *U. xanthippe* one pair of strong proximal steps and one pair of very indistinct distal steps).

**Redescription. Head.** Length: height: width ratio = 1: 1.14: 1.43. First flagellomere, 2 times as long as wide. Compound eye 1.25 times as high as long. Gena 0.7 times as high as length of first flagellomere (Fig. 24).

**Legs.** Completely yellow.

**Wing.** Entirely hyaline, in some specimens with indistinct smoky spots around crossveins r-m and dm-cu. Distance between crossveins 1.45 times as long as crossvein dm-cu.

**Terminalia.** Aculeus apex with two pairs of indistinct steps (Figs. 22–23). Tergite 5 of males as long as two preceding tergites.

**Measurements**. ♀: BL = 5.2–6.0mm (average 5.5), WL = 3.3–3.7mm (average 3.49), AL = 1.9–2.2 mm (average 2.1), AL/WL = 0.54–0.64 (average 0.6) (n = 7) (Korneyev & Merz 1998).

**Host plant.** *Cousinia mollis* Schrenk (Korneyev & Merz 1998).

**Distribution.** Southeastern Kazakhstan (Korneyev & Merz 1998).

**Urophora impicta** (Hering 1942)
(Figs. 25–29)


**Material examined.** Iran: 1♀, East Azerbaijan: Ajabshir, 1788m, 37°33'N, 45°58'E, 09.viii.2010, Gharejedaghi; 1♀, East Azerbaijan: Huri, 1750m, 37°32'N, 45°50'E, 01.iv.2010, Gharejedaghi; 23♂, 10♀, West
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Azerbaijan: Ziveh, 10km W Ziveh, swept from Cousinia sp., 2630m, 37°08'N, 44°52'E, 25.vi.2011, Mohamadzade; 4♀, Ziveh, 10km W Ziveh, swept from Cousinia sp., 2630m, 37°08'N, 44°52'E, 18.vi.2014, Mohamadzade; 2♂, 3♀, Qazvin, Taleghan, 5km E Khoznan, swept from Cousinia sp., 2150m, 36°06'N, 50°39'E, 05.vi.2014, Mohamadzade & S. Korneyev; Israel: 4♂, 4♀, Mount Hermon 2000m, 29.v.2000, Korneyev & Kameneva (SIZK and SMNC).

Turkmenistan: 2♂, 2♀, Kopetdagh, Chuli, from flower heads of Cousinia eryngioides, 25.iv.1975 (emergence date not given) (1 ♀ dissected), Dyakonchuk (SIZK).

Redescription. Head. Length: height: width ratio = 1: 1.33: 1.6. First flagellomere 1.6 times as long as wide. Compound eye 1.2 times as high as long. Gena 1.6 times as high as length of first flagellomere. (Fig. 27). Legs Mostly yellow; in specimens from altitudes above 2000m all femora black basally, but in specimens from lowlands (less than 2000m) legs completely yellow except fore femur with black stripe posterodorsally (Fig. 25). Wing. Hyaline. Distance between crossveins r-m and dm-cu 1.2 times as long as crossvein dm-cu (Fig. 25). Terminalia. Aculeus tip with one pair of distinct preapical steps, distance between apices at the level of preapical steps twice as
long as distance between their apices to aculeus tip; apex without notch (Figs. 28–29). Tergite 5 of male as long as three preceding tergites.

**Measurements.** ♂: BL = 4.5–5.5 mm (average 4.8), WL = 4–4.5 mm (average 4.25); ♀: BL = 8–10 mm (average 9.4) WL = 4.3–5.25mm (average 4.8), AL = 3.4–4.2 mm (average 4), AL/WL = 0.7–0.85 (average 0.74) (n = 10).

**Distribution.** Russia (Volgograd), Israel, Iran, Turkmenistan and Afghanistan (Freidberg 1974; Norrbom et al. 1999; Korneyev & White 1999; Gharali et al. 2008).

**Host plant.** Cousinia hermonis Boiss. (Freidberg 1974); C. eryngioides Boiss. (Korneyev & White 2000).

**Discussion.** White & Korneyev (1989) and Korneyev & White (1993) redescribed both nominal species based on type or topotypic specimens and noted that they differ only in femora coloration (widely black basally in U. hermonis, yellow with fore femur striped black posterodorsally in U. impicta). Specimens from higher altitudes (more than 2000m) from throughout the range appear have leg color similar to specimens from Israel and appear to be darker morphs of U. impicta, otherwise showing no essential differences. I therefore consider these two names to be synonyms.

**Urophora kasachstanica** (Richter 1964)

(Figs. 30–34)


**Material examined.** Iran: 1♂, Fars Province, Kavar, 1570 M, 29°11’ N 52°42’ E, 05.iv.2010, Fazel (the author studied the picture of this specimen with Dr. Valery Korneyev’s kindness); Kyrgyzstan: 1♂, Bishkek, Tshon-Aryk, 1500M, 05.vi.1994, Korneyev; 1♀, Chon-Aryk prope Bishkek, 1200m, 05.vi.1994, Korneyev (SIZK); 1♀, Talas valley, 10.3km from Kok-Sai, steppe, 1700–1850m, 42°26’ N, 71°00’ E, 26.vi.1998, Korneyev & Kameneva (SMNC); 1♂, Moldo-Too mts., Korogo pass, 105km W of Naryn, 61km NE of Kazarman 2000–2700m, 41°31’ N, 73°42’ E, 12.vii.1998, Korneyev (SMNC).

**Diagnosis.** U. kasachstanica differs from U. stalker by the shape of apex of aculeus (two pairs of distinct steps), absence of dark spots and stripes on femora and absence of subbasal band on wing.

**Redescription.** **Head.** Length: height: width ratio = 1: 1.15: 1.45. First flagellomere, 2.7 times as long as wide. Compound eye 1.3 times as high as long. Gena 0.25–0.35 as high as eye and 0.75 times as high as length of first flagellomere (Fig. 32). **Legs** completely yellow (Fig. 30). **Wing** pattern with three well developed dark brown crossbands. Subbasal band reduced; discal crossband complete, crossing wing from pterostigma through r-m crossvein to posterior margin, or broken into spots; preapical crossband complete, reaching posterior margin; apical band well developed, always widely separated from preapical band. Distance between crossveins r-m and dm-cu about 1.4 times as long as crossvein dm-cu (Fig. 30). **Terminalia.** Aculeus apex with two pairs of distinct steps (Figs. 33–34). Tergite 5 of male as long as three preceding tergites.

**Measurements.** 2♂: WL = 2.5–3.8mm (average 3.1), AL = 1.5–2.9 mm (average 1.9), AL/WL = 0.43–0.81 (average 0.6) (n = 22) (Korneyev & White 1993).

**Host plant:** Acroptilon repens L. (Korneyev & White 1993; 2000).

**Distribution.** Ukraine, Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan and Iran (Korneyev & Merz 1999; Fazel et al. 2011).

**Comments.** Among the species of the U. xanthippe species group only U. kasachstanica and U. stalker have the wing pattern with brown crossbands. U. kasachstanica differs from U. stalker in having only three brown crossbands, with the apical and preapical crossbands are widely separated, in addition to shorter wing length (U. stalker has four crossbands). Furthermore the aculeus tip in U. kasachstanica has two pairs of distinct preapical steps, but the second pair of steps in U. stalker is diminished. On the other hand U. affinis and U. pauperata have similar wing patterns, with three separated crossbands and lacking the basal band, but U. kasachstanica differs in having yellow notopleuron and aculeus tip with two pairs of distinct steps.

*Urophora stalker* Korneyev 1984

(Figs. 35–40)


**Material examined. Iran:** 1 ♀, East Azerbaijan Province, Ajabshir, 1469m, 37°31′ N, 46°07′ E, 24.vii.2010, Gharejadgahi; **Kyrgyzstan:** 2 ♀, 1 ♂ Bishkek, Tshon-Aryk, 1500m, 05.vi.1994, Korneyev (SIZK, SMNC); 1 ♀, Talas valley, 10.3km from Kok-Sai, steppe, 1700–1850m, 42°26′ N, 71°00′ E, 26.vi.1998, Korneyev & Kameneva
Diagnosis. *U. stalker* differs from other species of the *U. xanthippe* species group in having the wing pattern with four brown crossbands (with three crossbands in *U. kasachstanica* and without crossbands in the other species).

Redescription. Head. Length: height: width ratio = 1: 1.21: 1.5. First flagellomere two times as long as wide. Compound eye 1.3 times as high as long. Gena 0.25–0.40 as high as eyes and 0.75 times as high as length of first flagellomere (Fig. 38). Legs yellow, fore femur with black dorsal stripe, mid and hind femora in some specimens with ventral black spots. Wing pattern with four brown crossbands. Subbasal band developed from anterior margin to anal vein; discal crossband complete, crossing wing from pterostigma through r-m crossvein to posterior margin and widely separated from subbasal crossband; apical band well developed. If preapical and apical crossbands fused narrowly in cell r, preapical crossband is complete and reaching posterior margin; or if separated, preapical crossband developed only around dm-cu. Distance between crossveins r-m and dm-cu about 1.4 times as long as dm-cu crossvein (Figs. 35 & 37). Terminalia. Aculeus narrow and brown, 17.5 times as long as wide (Fig. 40), aculeus apex with distinct proximal and indistinct distal steps (Fig. 39). Tergite 5 of males as long as three preceding.

Measurements. ♀: WL = 4.1–5.2mm (average 4.6), AL = 2.7–4.1 mm (average 3.5), AL/WL = 0.57–0.85 (average 0.75) (n = 13) (Korneyev & White 1993).

Host plant. *Cousinia sewertzowii* Regel and *Cousinia* sp. (Korneyev & White 1993; 2000).


*Urophora xanthippe* (Monro 1934)
(Figs. 41–45)


Diagnosis. *U. xanthippe* is similar to *U. iani* in having small size and hyaline wing, but it can be easily distinguished by its aculeus apex with one pair of distinct steps.

Redescription. Head. Length: height: width ratio = 1: 1.17: 1.5. First flagellomere 1.8 times as long as wide. Compound eye 1.2 times as high as long. Gena as high as length of first flagellomere (Fig. 43). Legs completely yellow (Fig. 41). Wing entirely hyaline. Distance between crossveins 1.3 times as long as dm-cu crossvein (Fig. 41). Terminalia. Aculeus with one pairs of distinct preapical steps, as in Fig. 45. Tergite 5 of males as long as two preceding tergites.

Measurements. ♀: WL = 2.6–3.6 mm (average 3.1) (n = 4); ♀: WL = 3.1–3.8mm (average 3.5), AL = 1.5–2.5 mm (average 2.1), AL/WL = 0.43–0.75 (average 0.59) (n=33) (Korneyev & White 1993).

Host plant. *Acroptilon repens* (L.) DC (Korneyev & Kameneva 1984; Korneyev & White 1993; 2000).

Distribution. Ukraine, Kazakhstan, Uzbekistan, Turkmenistan, Tajikistan, Iran and Afghanistan (Korneyev & White 1999; Karimpour 2011).
FIGURES 41–45. *Urophora xanthippe* 41. Total view, left ♀. 42. Mesonotum. 43. Head in profile. 44. Aculeus. 45. Aculeus tip.

**Conclusion**

The yellow notopleuron and margin of the scutum adjacent to the notopleuron and postpronotal lobe are believed to
be synapomorphies that support the monophyly of the *Urophora xanthippe* group. In other species of *Urophora* the notopleuron and scutum are black, except some specimens of *U. terebrans*. The latter species infests plants of different genera, and has the coloration of the anterolateral margin of scutum and the notopleuron variable, occasionally partly yellow, but conspicuously narrower than in the species of *xanthippe* group. *U. terebrans* is similar to *U. stalker* in wing pattern (both species with four crossbands), but can be distinguished further by the shape of the aculeus tip (with two pairs of distinct steps in *U. terebrans*, whereas the second pair of steps in *U. stalker* is diminished (Fig. 39)). In addition, *Urophora korneyevi* White 1999 (= *U. arctii* Korneyev & White 1993), which is possibly a synonym of *U. terebrans* (V. A. Korneyev, pers. comm.), lives in flower heads of *Arctium*. The genus *Arctium* is considered now a part of the *Cousinia* clade (which is clearly paraphyletic without *Arctium*, but these two names have not been formally synonymized) (López-Vinyallonga et al. 2009). *U. terebrans* is a wide oligophagous species, which is using also *Arctium* and *Onopordum* related to the hosts common for the flies of the *xanthippe* group (*Cousinia, Onopordum, occasionally Acriptilon*). We therefore consider *U. terebrans* to be possible sister species of the *xanthippe* group. Further relationships in the group and specialization for host plants need further detailed study involving also molecular methods.

Specimens of *U. stalker* vary strongly in wing pattern, depending on their host plants, and might represent several host races. Reduction of the wing pattern is possibly independent in lineages and not necessary reflecting their relationship; for example, in *U. kasachstanica* the wing pattern has three crossbands, but in *U. xanthippe* and *Urophora* sp. near *dirlbeki* the wing is hyaline, though all three species infest *Acerption repens*. In addition, *Urophora dirlbeki* (with hyaline wing) and *U. terebrans* (with banded wing pattern) are associated with *Onopordum acaanthium* and are similar in the length of aculeus and shape of its apex, and also might be closely related.

In all cases, where reduction of wing pattern and shift of larval feeding contradict each other and can rise independently several times, further studies are needed to clarify phylogenetic relationships in this group.

This revision summarizes only preliminary results based mainly on newly obtained Iranian material, but more extensive study of the fruit flies associated with the large genus *Cousinia*, which includes over 500 species in the Middle East, is needed.

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