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Notes on Geographic Distribution

Genus *Epistrophe* Walker, 1852 (Insects: Diptera: Syrphidae) in Northern Iran, with a new species record

Farzaneh Kazerani [1], Ali Asghar Talebi [1*] and Ebrahim Gilasian [2]

1 Tarbiat Modares University, Department of Entomology, Faculty of Agriculture, P.O.Box: 14115-336, Tehran, I.R. Iran
2 Institute of Plant Protection, Department of Insect Taxonomy, P.O.Box:1454-19395, Tehran, Iran
* Corresponding author. E-mail: *talebia@modares.ac.ir*

Abstract: The genus *Epistrophe* Walker, 1852 (Diptera: Syrphidae) was studied in the north of Iran. The specimens were collected using malaise traps between March and August 2011. Three species were collected and identified: *Epistrophe nitidicollis* (Meigen, 1822), *E. eligans* (Harris, 1780) and *E. euchroma* (Kowarz, 1885). *E. nitidicollis* is a new record from Iran. Geographical distribution of the three species are briefly discussed. An identification key with supplementary figures is presented for the species of the genus *Epistrophe* occurring in this region.

The hover flies or flower flies (Diptera: Syrphidae) have a worldwide distribution, with the greatest species diversity in the New World Tropics (Vockeroth 1992). This family comprises about 6000 described species in the world (Thompson 2012), and has been divided into three subfamilies: Microdontinae, Eristalinae and Syrphinae, and fourteen tribes (Thompson and Rotheray 1998).

The species of the genus *Epistrophe* are medium size hover flies with one generation per year (univoltine) and a long obligate diapause in the larval stage (Schneider 1948, Goeldlin de Tiefenau 1974). Almost 75 species of this genus are described in the world (Speight 2011). Dozkal and Schmidt (1994) listed 23 European species of the genus *Epistrophe.*

Epistrophe species are associated with forests, where they inhabit in open areas and forest edges, and are found on flowers and sunlit leaves. They probably also occur in the canopy layer. Larvae of *E. eligans* are aphid predators, and are usually associated with aphids on trees, but also occur on shrubs and tall herbs (Rotheray 1993). Láska and Stary (1980) found larvae of *E. nitidicollis* on the trees *Euonymus* sp., *Malus* sp., *Prunus* sp. and *Sambucus nigra*. Mazánek *et al*. (2001) also report its larvae on *Acer pseudoplatanus*, *Cerasus avium*, *Carduus* sp., *Rubus idaeus* and *Spirea* sp. Larvae of *E. euchroma* have been recorded feeding upon aphids on *Euonymus europaeus* and *Prunus avium. Epistrophe* larvae have a typically flattened shape and green color, a good camouflage on tree leaves (Rotheray 1993).

The eggs are laid in aphid colonies in different plants, known mostly on shrubs or trees. Schneider (1948) observed that the eggs hatched after two or three days and the larval stage lasts about eight days, after which it goes into diapause. Diapause occurs between rolled, dead leaves and such in the litter layer (Schneider 1969; Rotheray 1986; Speight 2007). The diapause lasts for up to all types of spring in the following and the duration of the subsequent pupal varies from nine days to one month.

The objective of this study is to provide an initial taxonomic and faunistic insight of the *Epistrophe* species in the north of Iran.

Material for this study was collected from different habitats in northern Iran using malaise traps (Figure 1). Samples were collected between March and August 2011. The specimens were extracted from the malaise traps and sorted weekly. Then, they were treated with 100% ethanol for 5 minutes followed by hexamethyldisilazane (HMDS) for 30 min and finally placed on the glass plate for drying. The dried specimens were then card-mounted and labeled. Morphological terminology follows Van Veen (2004), Stubbs and Falk (1983) and Doczkal and Schmid (1994). All specimens are deposited in the insect collection of the Department of Entomology, Tarbiat Modares University, Tehran.

Three species of the genus *Epistrophe* were collected and identified from the study area, including two previously reported species: *Epistrophe eligans* (Harris 1780), *Epistrophe euchroma* (Kowarz 1885) , as well as one newly recorded species, *Epistrophe nitidicollis* (Meigen 1822), which is marked with an asterisk in the key. The most abundant species was *E. euchroma* in the studied area.

Key to the species of the genus Epistrophe in Northern Iran

1a. Tergite 4 completely black (Figure 2C); Scutellum integrally yellow (Figure 2C). ..... *Epistrophe eligans*
1b. Tergite 4 with yellow band or spots (Figure 2A,B and 3A,D). Scutellum black with posterior margin yellow (Figure 3A,D). **2**

2a. Katepisternal patches of hairs clearly separated posteriorly; Tergites 3- 4 with oblique and large spots than tergite 2; Scutellum integrally yellow (Figure 2A, B)..... ..... *Epistrophe* (*Epistrophella*) *euchroma*
2b. Katepisternal patches of hairs joined posteriorly; Tergites 3-4 with two yellow bands (Figure 3A, D); Scutellum black with posterior margin yellow (Figure 3A, D). ..... *Epistrophe nitidicollis**

Figure 1. Iran's provinces where the *Epistrophe* species have been collected.

***Epistrophe eligans* (Harris, 1780)** (Figures 2C–D)

Synonyms: *Musca elegans* Villers, 1789, *Syrphus bifasciatus* Macquart, 1834 , *Musca eligans* Harris, 1780, *Syrphus fulvipes* Wiedemann, 1822, *Musca interruptus* Gmelin, 1790, *Syrphus trifasciatus* Strobl, 1898, *Scaeva volitans* Gravenhorst, 1807, *Scaeva fenestrata* Meigen, 1822.

Material examined: IRAN; Mazandaran Province: Noor, Tangevaz 36°21′55.2″ N, 52°06′10.74″ E, 692m, (1♀), 26.v.2011; leg. M. Kheirandish (Figure 1).

General distribution: Southern Sweden; Iberia; Ireland; Turkey; European parts of Russia; Caucasus (Speight 2011); Lithuania (Lutovinovas *et al.* 2003); England and Wales (Ball and Morris 2000); Iran (Gilasian 2007).

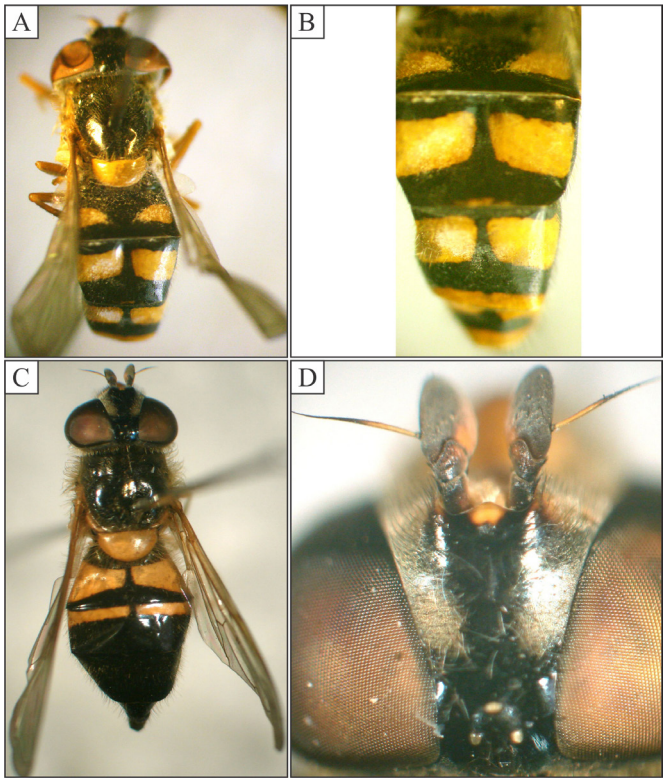

Figure 2. A-B) *Epistrophe euchroma*, A) female; B) dorsal view of abdomen; C-D) *Epistrophe eligans*, C) female; D) Antenna.

Biology: *Epistrophe eligans* prefer deciduous forest and scrub as well as suburban ornamental gardens (Speight 2011) and also Ball and Morris (2000) stated that adults visit the flowers of trees and bushes, particularly *Prunus spinosa* and *Crataegus* and found in Woodland edges, scrub, orchards, mature hedgerows and garden. They appear from end April to end August (Speight 2011), peak in May (Ball and Morris 2000).

***Epistrophe* (*Epistrophella*) *euchroma* (Kowarz, 1885)** (Figures 2A–B)

Synonyms: *Syrphus euchromus* Kowarz, 1885

Material examined: IRAN; Ghazvin Province: Zereshk road 36°25′39.36″ N, 50°06′36.9″ E, 1997m, (1♂ & 3♀), 30.iv.2011; Mazandaran Province: Noor, Gaznasara 36°16′58.08″ N, 52°10′55.62″ E, 2013m, (2♀), 26.v.2011; leg. A. Nadimi (Figure 1).

General distribution: Fennoscandia, Pyrenees, Spain (Ball and Morris 2000); Great Britain (southern England), central Europe (Ball and Morris 2000); Russia (Kowalesky 1885); south and eastern Siberia (Yakut) (Violovitsh 1986); Asia (Peck 1988); Serbia (Vujic and Glumac 1994); Iran (Khiaban *et al*. 1998).

Biology: *Epistrophe euchroma* usually found in broad leaved forests, rides and wood edges (Falk 1991). There seems to be a preference for old woods (Speight 2011). This species appear from April to June (Falk 1991). In this study, the specimens have been collected in April and May in the woodland area.

***Epistrophe nitidicollis* (Meigen, 1822)** (Figure 3)

Synonyms: *Syrphus nitidicollis* Meigen, 1822, *Syrphus protritus* Osten Sacken, 1877, *Stenosyrphus hunteri* Curran, 1925.

Material examined: IRAN; Mazandaran Province: Noor, Tangevaz 36°21′55.02" N, 52°06′10.74″ E, 692m, (1♀& 1♂), 3.viii.2011; leg. M. Kheirandish (Figure 1).

General distribution: Fennoscandia, Iberia, Ireland eastwards through northern, Italy, the former Yugoslavia, Bulgaria, Russia, Siberia, N America from Alaska south to California (Speight 2011), Nederland (Reemer 1999), Korea (Ku 1968). New record to Iranian insect fauna.

Biology: *Epistrophe nitidicollis* prefer deciduous

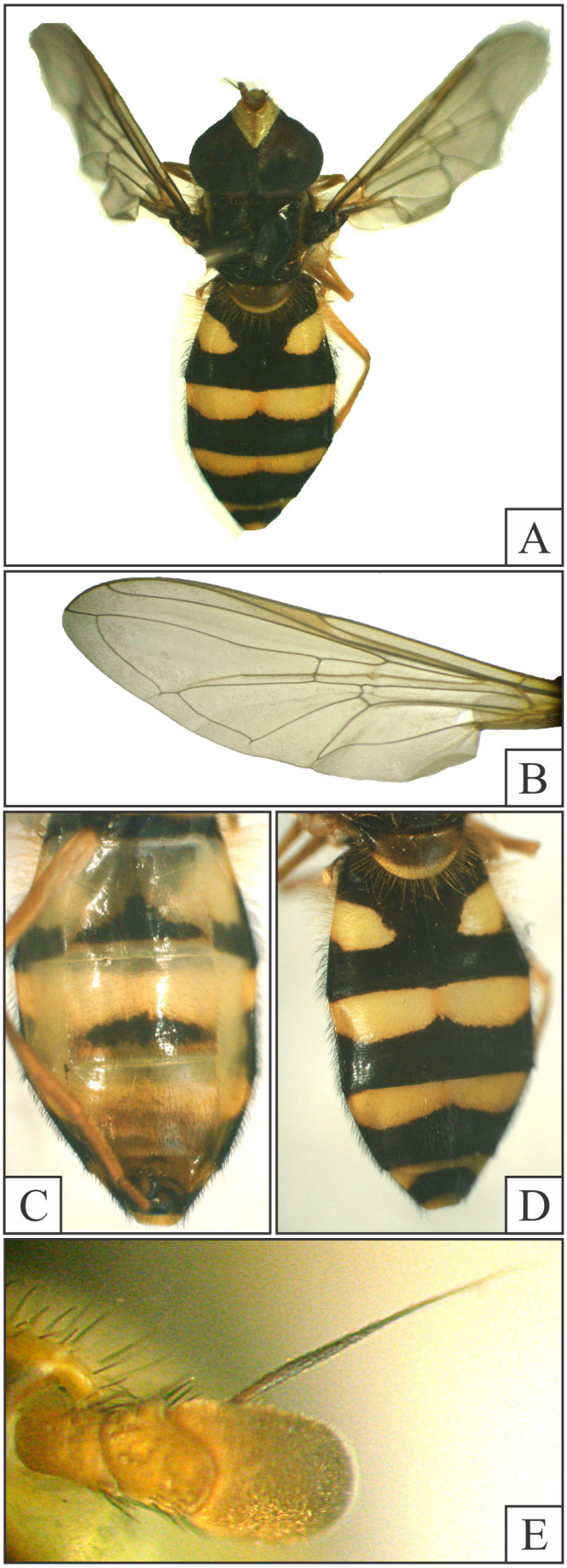

Figure 3. *Epistrophe nitidicollis*, male; A) Adult; B) Wing; C) Ventral view of abdomen; D) Dorsal view of Abdomen; E) Antenna.

woodland, scrub and marquis. Adult habitat is largely arboreal and visit flowers. Flying period is from May to July (Speight 2011, Falk 1991). The specimens in this study collected in early August in height altitudes.

Diagnosis: Head: Frons yellow with black hairs; antennae orange, basoflagellomere slightly darkened dorsally dark, arista black (Figure 3E); gena yellow, Mouth edge yellow; Thorax: scutum shiny black, notopleuron yellow, scutellum black, posterior margin yellow with almost black hairs and some yellow hairs; wing basal cell bm and/or br entirely covered by microtrichia (Figure 3B); legs entirely yellow; Abdomen: oval, tergite 1 black, tergite 2 with two yellow large spots, tergites 3-4 with two yellow bands, tergite 5 with narrower yellow band (Figure 3D); sternites white to yellow, sternites 2-3 with black bands (Figure 3C).

The adults of *Epistrophe* are similar to *Syrphus*, but their larvae are completely different morphologicaly. Fluke (1950) placed *Epistrophe* as subgenus of *Syrphus*. Wirth *et al*. (1965) recognized *Epistrophe* as a separate genus from *Stenosyrphus* (a junior synonym of *Melangyna* Verral, 1901). Dusek and Laska (1967) followed Wirth *et al*. (1965) and created a new genus (*Epistrophella*) for *Syrphus euchromus* Kowarz, 1885. Vockeroth (1969) indicated the unusual variation in thoracic and abdominal markings of *Epistrophe* and suggested to use two subgenera: *Epistrophe* and *Epistrophella*. The cladistic analysis by Rotheray and Gilbert (1989) placed *Epistrophe* with *Epistrophella*, and *Meligramma* together with *Parasyrphus* or with *Xanthogramma* and *Doros*. The analysis of larval morphology guided Rotheray and Gilbert to synonymize *Epistrophella* under *Meligramma*. Mengual *et al*. (2008) using molecular characters resolved *Epistrophella* close to *Xanthogramma*, in agreement with more recent larval evidence (Rotheray and Gilbert 1999). The clade *Epistrophella* + *Xanthogramma* was placed as sister group of *Chrysotoxum* + *Epistrophe*. The molecular evidence disagrees with the results by Rotheray and Gilbert as *Espitrophella* and *Meligramma* were resolved in different clades.

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