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FIRST RECORDS OF THE RARE FAMILY CLUSIIDAE (DIPTERA, OPOMYZOIDEA) FROM IRAN

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First Records of the Rare Family Clusiidae (Diptera, Opomyzoidea) from Iran. Kazerani, F., Beuk, P., Farashiani, M. E., Kiasari, Sh. Mohammadnezhad. — During our research on the Diptera fauna ofnorthern Iran during 2017–2018, three species of the family Clusiidae have been collected and identified. *Clusiaflava* (Meigen, 1830), *Clusia tigrina* (Fallén, 1820) and *Clusiodes ruficollis* (Meigen, 1830) are recorded from Iran for the first time. These also represent the first records of the family Clusiidae from Iran.

Key words: Diptera, Fauna, Clusiidae, first record, Iran.

Introduction

Flies of the family Clusiidae are commonly called "druid flies". The family belongs to the superfamily Opomyzoideain the suborder Acalyptrata. Till now 636 species have been described allover the world (Lonsdale, 2017) of which only 15 are known from Europe (Hellqvist, 2018).The larvae live in moist, decaying wood and are assumed to feed by sucking microorganisms in the decaying wood (Rotheray & Horsefield, 2013). In addition they have been found in other moist microhabitats with high rates of (vegetable) organic matter, for example near dung baits (Ferrar, 1987; Roháček, 1995; Lonsdale et al., 2010).

This family can be distinguished by the following characters: dark brown to pale yellow species of moderate to large body size and relatively slender build; one pair of vibrissae; wing usually with at least a cloudy infuscation along the anterodistal margin, a complete subcostal vein, one subcostal break; and an angular extension on the outer and sometimes inner surface of the pedicel.

Soós (1984) provided a catalogue of the family Clusiidae in the Palearctic Region. Stackelberg (1989) prepared a key to the clusiid species of the European Part of the USSR. Roháček (1995) discussed the biology and behavior of Clusiidae in the Czech and Slovak Republics. Lonsdale & Marshall (2007) is reviewed the taxonomy of *Clusiodes* Coquillett, 1904 and *Hendelia* Czerny, 1903 and gave a key to the *Clusiodes* species of the Old World. Lonsdale et al. (2010) presented a phylogenetic analysis of the druid flies based on morphological and molecular data. Lonsdale (2017) provided a World Catalogue of the family.

This study is presents information on the species of the family Clusiidae recently acquired during fieldwork in various parts of Hyrcanian forests by the Iranian authors of this paper.

Material and methods

All the material examined was collected by sweep net and pan traps during 2017 from vegetation in Shast-Kola, Neka and Shafarood forests. These forests are virgin mixed deciduous forests belong to Hyrcanian forests. Specimens are preserved in 75 % ethanol and deposited in the insect museum of national botanical garden of Iran and in the Natuuurhistorisch Museum Maastricht, Maastricht, the Netherlands (NHMM). Specimens were examined using binocular stereoscopic microscopes. Label data are standardized and presented in full. For Clusiidae the nomenclature used in Fauna Europaea is followed Lonsdale & Marshall (2007, 2008) and Lonsdale (2017).

Results

In total, three species of the family Clusiidae were collected and identified. All three are newly recorded for the Iranianfauna. These also constitute the first records of the family Clusiidae from Iran.

Clusia Haliday 1838

Type species: *Heteromyza flava* Meigen 1830

Synonym: *Paraclusia* Czerny, 1903, synonymy established by Lonsdale & Marshall (2008)

The genus *Clusia* is distinguished from the other genera by the following characters: A pair of incurved interfrontal bristles. Scutellum usually with two pairs of lateral bristles that are longer than the scutellum. Arista pubescentor short-plumose. Cross-veindm-cu usually broadly infuscated. Scutellum with yellow central stripe. At least mid-tibiae without preapical bristles.

Clusia flava (Meigen, 1830) (fig. 1)

Material examined: Iran, Golestan province, Shast-Kola forests [36°43'10" N, 54°24'17" E], 817 m, sweeping net, 10.06.2017, 1 ♀; Mazandaran province, Neka [36°22'42.03" N, 53°33.05'52.7" E], 1210 m, sweeping net, 27.07.2018, 5 ♀, 1 ♂ (Kazerani & Mohammadnezhad Kiasari).

Diagnostic characters: Palpi yellow, black at apex; antenna with scape and pedicel pale yellow, post-pedicel black in upper part and pale yellow in lower part; thorax yellow with or without a pair of narrow black dorsocentral stripes that may continue onto scutellum; apair of lateral black stripes may be present on either side of the notopleural suture, the dorsal one running from the postpronotum to the base of wing, the ventral one running from the prothoracic stigma to the halter but with a short interruption at the suture between the anepimeron and the pteropleuron; legs including coxae and trochanters whitish yellow to yellow, femora often paleron basal half, mid en hind tibiae often darker on basal half; abdomen yellow either with or without dark pattern on tergites, when present at least with black spots at lateral margins of tergites, dorsal parts of tergites then either with or without broad blackspots which may merge to form complete crossbands over the tergites.

Distribution: Palearctic: Europe, Russia, Japan.

Clusia tigrina (Fallén, 1820) (figs 2–3)

Material examined: Iran: Golestan province, Shast-Kola forests [36°43'00.7" N 54°23'13.7" E], 1271 m, pan traps, 12.07.2017, 1 ♀; Mazandaran province, Neka [36° 22'42.03" N 53° 33.05'52.7" E], 1210 m, sweeping net, 2 ♀, 1 ♂ (Kazerani & Mohammadnezhad Kiasari).

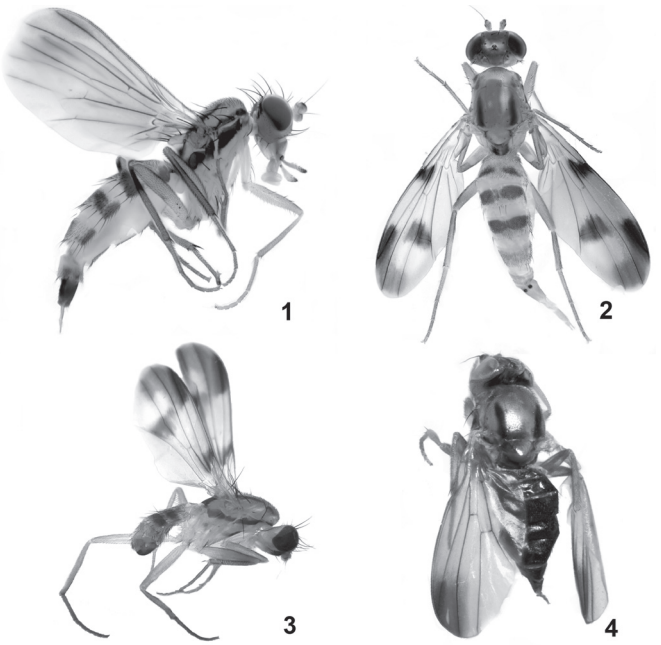
Diagnostic characters: Palpi white; antenna scape and pedicel light yellow, post-pedicel yellow, black at apex; thorax yellow with 2 brown on dorsocenteral part from transverse suture to near the scutellum; scutellum totally yellow; scutum laterally with a brown band from humeral to base of wing; Wings with a dark cloud around R_1 and base of R_{2+3}, R_{4+5}, also with a dark cloud around the R_{2+3}, R_{4+5} and M_{1+2} at apex, M_{1+2} with a black cloud at middle around dm-cu, legs totally yellow, coxa white; Abdomen tergites yellow, 2nd tergite with 2 brown spots, 3rd–4th tergites with brown band.

Distribution: Palearctic: Europe, Russia.

Clusiodes Coquillett 1904

Type species: ***Heteroneura albimana*** Meigen, 1830

This genus is characterized by the following characters: Arista with hairs shorter than width of central of arista. Pedicel with single bristle on dorsal and ventral margins. Interfrontal bristles well-developed. Two or three fronto-orbital bristles, curved backward. Mid genal bristles well-developed. Two or three dorsocentral bristles. Scutum usually with one pair of



Figs 1–4: 1 — female habitus of *Clusia flava* (Meigen, 1830), lateral view; 2 — female habitus of *Clusia tigrina* (Fallén, 1820), dorsal view; 3 — male habitus of *Clusia tigrina* (Fallén, 1820), lateral view; 4 — female habitus of *Clusiodes ruficollis* (Meigen, 1830), dorsal view.

white lateral stripes. Male fore and mid femora with one anterior and two posterior rows of ventral spinous bristles. Mid and hind tibiae with two pairs of dorsal pre-apical bristles.

Clusiodes ruficollis (Meigen, 1830) (fig. 4)

Material examined: Iran: Golestan province, Shast-Kola forests [36°43'00.7" N, 54°23'13.7" E], 1271 m, pan traps, 12.07.2017, 1 ♀ (Kazerani & Mohammadnezhad Kiasari); Gilan province, Shafarood forests [37°40'15.1" N, 48°45'09.6" E], 1138 m, sweep net, 15.07.2018, 1 ♀ (Kazerani).

Diagnostic characters: Face and gena white; palpa totally yellow; Antenna scape and pedicel light yellow, pedicel with one outstanding bristle on dorsal margin; post-pedicel black in upper part and white in lower part; thorax yellow with 2 brown lateral band; scutellum totally brown. Legs totally white; Abdomen tergites brown;

Distribution: Palearctic: Europe, Russia.

Practical key to the species of Clusiidae in Iran

1. Wing with three separate, large markings, covering the tip of R1, crossveindm-cu and along the tip wing covering the apices of R_{2+3}, R_{4+5} and M (figs 2–3). ..... *Clusia tigrina*
— Wing with a single cloud-like marking near the wing tip only, though the whole wing may be darkened as well (figs 1 & 4).....2
2. Anterior orbital setae curved inwards. ..... *Clusia flava*
— All orbital setae curved backwards..... *Clusiodes ruficollis*

Discussion

This study was conducted in Shafarood and Shast Kola forests that belong to the temperate deciduous Hyrcanian forests. These are the old and precious beech (*Fagus orientalis* Lipsky) forest, while other species, like oak (*Quercus* spp.), ash (*Fraxinus excelsior* L.), maple (*Acer* spp.), large leaved lime (*Tilia platyphyllos* L.), etc., can be found there. There is no indication that all clusiid species specialize on specific tree species and it is presumed that most species can occur in both coniferous and decidu-

ous forests (Roháček, 1995; Rotheray & Horsefield, 2013). Sueyoshi (2006) surveyed the species diversity of the Clusiidae in Japan and stated that they are mostly distributed in the temperate or boreal forests.

Decaying trees provide a very valuable resource for many scarce and rare insects. *Clusia tigrina* is mostly associated with dead beech in forests and copses and known as a rare species and included in several Red Data lists (Głowaciński, 2002; Roháček, 2012; Falk et al., 2016). Smith (1950) collected puparia of *Cla. flava* in a dry beech stump. Roháček (1995) reared *Clo. ruficollis* from dead fallen trunks and stumps of various deciduous trees from lowlands to mountains in the Czech and Slovak Republics. Puparia of *Clo. ruficollis* were found in rotting wood of birch, alder and aspen. Martinovský & Roháček (1993) also observed this species on very rotten and moist beech trunks. The presence of Clusiidae in the Hyrcanian forests is entirely in accordance with the strong relation between the clusiid species and decaying trees in deciduous forests. They appear not to be abundant in the studied area, as for all the species only few specimens were found. Their rarity may be somewhat overestimated because Malaise traps often collect relatively few Clusiidae.

This study indicates that, based on the biology of the family, more species of druid flies are likely to be found in Hyrcanian forests. Further surveys are required to establish which additional species of Clusiidae belong to the fauna of Iran.

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