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## THE GENERA *NEMOTELUS* AND *OXYCERA* (DIPTERA, STRATIOMYIDAE) IN THE ARASBARAN FORESTS

S. Khaghaninia<sup>1</sup>, F. Kazerani<sup>2\*</sup>, M. Hauser<sup>3</sup>

<sup>1</sup>Faculty of Agriculture, Department of Plant Protection, Tabriz University, Tabriz, 51664 Iran

<sup>2</sup>Young Researchers and Elite Club, Tabriz Branch, Islamic Azad University, Tabriz, Iran

<sup>3</sup>California Department of Food and Agriculture, Plant Pest Diagnostics Branch, 3294 Meadowview Road, Sacramento, CA 95832-1448, USA

\*Corresponding author

E-mail: farzane.kazerani@gmail.com

**The Genera *Nemotelus* and *Oxycera* (Diptera, Stratiomyidae) in the Arasbaran Forests. Khaghaninia, S., Kazerani, F., Hauser, M.** — The soldier flies of the genera *Nemotelus* Geoffroy, 1762 and *Oxycera* Meigen, 1803 collected in the Arasbaran forests (northwestern of Iran) during 2009–2012. A total of nine species were collected of which eight species [*Nemotelus rudifraci* (Berezovsky, Nartshuk, 1993); *N. nigrinus* Fallén, 1817; *N. notatus* Zetterstedt, 1842; *N. pantherinus* (Linnaeus, 1758); *Oxycera fallenii* Staeger, 1844; *O. meigenii* Staeger, 1844; *O. notata* Loew, 1873; *O. trilineata* (Linnaeus, 1767)] are recorded for the first time from Iran. Data on the geographical distribution of these species with figures are provided.

Key words: Stratiomyidae, Clitellariinae, new records, East Azerbaijan, Iran.

**Роды *Nemotelus* и *Oxycera* (Diptera, Stratiomyidae) в лесах Арасбарана. Хаганинья С., Казерани Ф., Хаузер М.** — Мухи-львинки родов *Nemotelus* Geoffroy, 1762 и *Oxycera* Meigen, 1803 собранные в лесах Арасбарана (северо-западный Иран) в 2009–2012 годах. Всего было собрано девять видов этих мух, из которых восемь видов: *Nemotelus rudifraci* (Berezovsky, Nartshuk, 1993); *N. nigrinus* Fallén, 1817; *N. notatus* Zetterstedt, 1842; *N. pantherinus* (Linnaeus, 1758); *Oxycera fallenii* Staeger, 1844; *O. meigenii* Staeger, 1844; *O. notata* Loew, 1873; *O. trilineata* (Linnaeus, 1767), отмечены в Иране впервые. В статье представлены иллюстрации насекомых и данные об их географическом распространении.

Ключевые слова: Stratiomyidae, Clitellariinae, новые записи, Восточный Азербайджан, Иран.

### Introduction

The family Stratiomyidae includes more than 2650 species in 375 genera in 12 subfamilies worldwide of which 426 species in 55 genera in 7 subfamilies occur in the Palearctic Region (Woodley, 2001). The species of this family are small to large (body length 2–28 mm), highly varied in shape and coloration, wings hyaline to variously infuscated or patterned. Some species mimic wasps and bees, particularly in flight (Rozkošný, Nartshuk, 1988).

Most larvae of the genus *Oxycera* are aquatic, with some rare exceptions, which are terrestrial. Several species are found on stones with a thin film of running water. All known *Nemotelus* larvae are aquatic and can tolerate high levels of salinity (McFadden, 1967; James, 1969). Adults are most often found on foliage in damp forests, near bodies of water, or near boggy areas and some of them visit flowers (James, 1981).

Iran has wide forests mostly in northern and northwestern parts with appropriate conditions for development of stratiomyids. Recently, Kazerani and Khaghaninia (2013, 2014) provided a survey related to the Stratiomyidae fauna in Iran, reported the genus *Oplodontha* Rondani, 1863 from Iran and also they recorded four species belonging to 3 genera of the subfamily Beridinae (Diptera, Stratiomyidae): *Actina chalybea* Meigen, 1804; *Beris schaposchnikowi* Pleske, 1926; *B. clavipes* (Linnaeus, 1767), and *Chorisops nagatomii* Rozkošný, 1979. As the stratiomyid fauna was poorly studied in Iran, the objective of this study is to provide a faunistic insight of the family Stratiomyidae in north-western Iran with special focus of forest habitats.

## Material and methods

Flies were collected in the Arasbaran forests using sweeping net in 2009 and 2012. Arasbaran is a registered biosphere reserve in the East Azerbaijan province, Iran; it is situated in the Caucasus–Iranian–Highlands in northern Iran, with a common border to Armenia and Azerbaijan. The area is influenced by the Caspian, Caucasus and Mediterranean regions and located from 38°40'22.054" to 39°08' 24.235" N and 46°39'21.023" to 47°02'20.125" E. This area has semi-arid steppes, rangelands and forests, rivers and springs with a varying altitude from 256 m in the vicinity of Araz River to 2896 m and covers an area of 78560 ha. It is registered in world heritages by UNESCO since 1976.

For identification, the flies were examined under a Nikon (SMZ 1000) binocular microscope. Morphological terminology follows Nartshuk (1988) and Rozkošný (1998). All specimens are deposited in the insect collection of Professor Hasan Maleki Milani, Tabriz, Iran (ICHMM).

## Key to studied species<sup>1</sup>

1. Scutellum unarmed, without marginal spines; head almost with conical facial projection (fig. 1). ..... *Nemotelus* Geoffroy ..... 2
- Scutellum with 2 marginal spines; head without conical facial projection (fig. 2). ... *Oxycera* Meigen ... 6
2. Face short, rounded; rostellum practically absent under antenna with only small callus); female: abdomen black, 2–4 tergites with white triangular spot in the middle; male: 1rd tergite black, 2–4 tergites white, 5th tergite black with 2 white spots, male genitalia as (fig. 1, g–h). ..... *N. rudifraci* (Berezovsky et Nartshuk)
- Face extended anteriorly in to the rostellum (fig. 1, f). ..... 3
3. Distance from antennal base to end of rostellum less than distance from antennal base to commencement of narrow part of frons (fig. 1, f). ..... 4
- Distance from antennal base to end of rostellum equal to or greater than distance from antennal base to commencement of narrow part of frons (fig. 1, b). ..... 5
4. Abdomen entirely black except margin of tergites with narrow yellow strip (fig. 1, a). ..... *N. argentifer* Loew
- Abdomen with different coloration, male abdomen white except 5th tergite, rostellum equal in length to antenna excluding arista (fig. 1, e–f). ..... *N. pantherinus* (Linnaeus)
5. Distance from antennal base to end of rostellum greater than distance from antennal base to commencement of narrow part of frons, vein R4 absent; female: face and body entirely metallic green-black (fig. 1, b). ..... *N. nigrinus* Fallén
- Distance from antennal base to end of rostellum more equal to distance from antennal base to commencement of narrow part of frons, vein R4 present; male abdomen mostly white; genitalia as figs; Female: abdomen black with white triangular spots in the middle (fig. 1, c–d). ... *N. notatus* Zetterstedt
6. Green flies with three longitudinal black stripes on mesonotum and black narrow transverse bands on abdomen (fig. 2, f). ..... *O. trilineata* (Linnaeus)
- Predominantly black species with yellow pattern. .... 7
7. Yellow spots on abdomen connected along lateral tergites (fig 2, d–e). ..... *O. notata* Loew
- Yellow spots on abdomen not connected along lateral tergites. .... 8
8. Legs entirely yellow; longitudinal stripes on mesonotum not connected with humeral spots; lateral spots on abdomen in 3 pairs on 2–4 tergites and oblique and directed forward and toward center (fig. 2, a). .... *O. fallenii* Staeger
- Femora 1 and 2 in basal half and anterior tarsi black; longitudinal stripes on mesonotum connected with humeral spots; lateral spots on abdomen in 3 pairs on 2–4 tergites and oblique; male genitalia as (fig. 2, b–c). ..... *O. meigenii* Staeger

### *Nemotelus argentifer* Loew, 1846 (fig. 1, a)

Material examined. Iran: East Azerbaijan, Mekidi valley (central part of Arasbaran forests), 38°50'14.4" N 46°54'15.01" E, 1426 m, 13.07.2009, 2 ♀ (Khaghaninia leg.).

Distribution: Most parts of Europe, Armenia, Russia, Turkey, Iran (Woodley, 2011).

### *Nemotelus nigrinus* Fallén, 1817\* (fig. 1, b)

Material examined: Iran, East Azerbaijan, Chichekli (located in western part of Arasbaran forests): 38°30'34.02" N, 46°37'23.46" E, 1689 m, 7.07.2012, 1 ♀ (Khaghaninia leg.).

<sup>1</sup> Modified from Nartshuk (1988) and Rozkošný (1998).

Distribution: Afghanistan, Azerbaijan, most parts of Europe (Woodley, 2001); **first record for Iran.**

Remark: This species can be easily identified by shiny black body and black legs (fig. 1, *b*).

*Nemotelus notatus* Zetterstedt, 1842\* (fig. 1, *c-d*)

Material examined: Iran, East Azerbaijan, Oskulu Region (located in center of Arasbaran forests); 38°51'48.78" N, 46°50'45.54" E, 1667 m, 2.08.2009, 1 ♀, 2 ♂ (Khaghaninia leg.).

Distribution: Palaearctic (most parts of Europe) (Woodley, 2001; Popescu-Mirceni and Parvu, 2009), **first record for Iran.**

Remark: Mason et al. (2009) synonymized *N. brachystomus* with *N. notatus*, this species was reported under the name *N. brachystomus* from all over the Middle East. Studied specimens of this species have some variation in genitalia compared with other

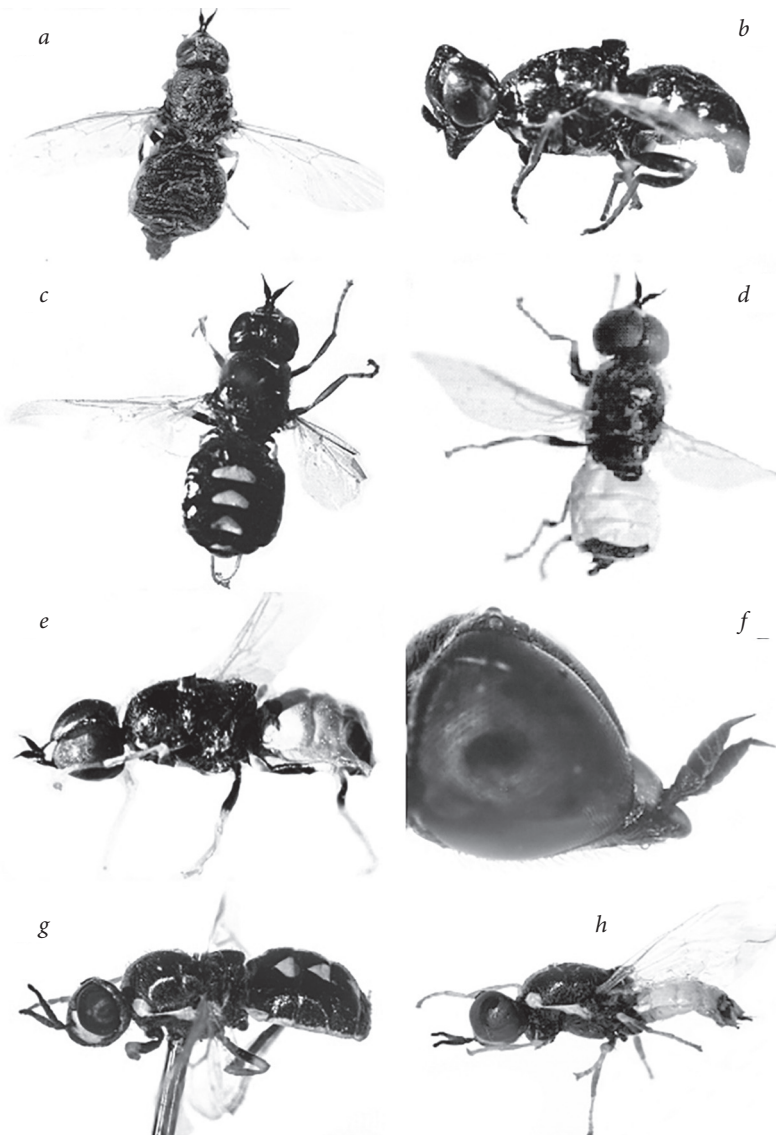


Fig. 1. *Nemotelus argentifer*: female dorsal view (*a*); *Nemotelus nigrinus*, female, lateral (*b*); *Nemotelus notatus*: female, dorsal view (*c*), male, lateral view (*d*); *Nemotelus pantherinus*: male, lateral view (*e*), lateral view of the head (*f*); *Nemotelus rudifraci*: lateral view of a female (*g*), lateral view of a male (*h*).

European and western populations, such as very long pointy inner processes. There might be several distinct species under the concept of *N. notatus*, but this is beyond the scope of our investigation.

*Nemotelus pantherinus* (Linnaeus, 1758)\* (fig. 1, e–f)

Material examined: Iran, East Azerbaijan, Chichekli (located in western part of Arasbaran forests): 38°30'34.02" N, 46°37'23.46" E, 1689 m, 7.07.2009, 1 ♀ (Khaghaninia leg.).

Distribution: Widespread Europe, Armenia, Azerbaijan, Russia, Turkey, Tajikistan (Woodley 2001), first record for Iran.

Remark: The most important characters for identification of this species are: length of last flagellomere as long as the three preceding ones and postocular band as wide as length of the 3 basal flagellomere (fig. 1, f); male abdomen mostly white, only the last segments black (fig. 1, e).

*Nemotelus rudifraci* (Berezovsky et Nartshuk, 1993)\* (fig. 1, g–h)

Material examined: Iran, East Azerbaijan, Chichekli (western part of Arasbaran forests), 38°31'6.11" N, 46°32'1.85" E, 1733 m, 3.07.2011, 1 ♀, 1 ♂ (Khaghaninia leg.).

Distribution: Azerbaijan, Turkey (Woodley, 2001; Berezovsky and Nartshuk, 1993), **first record for Iran.**

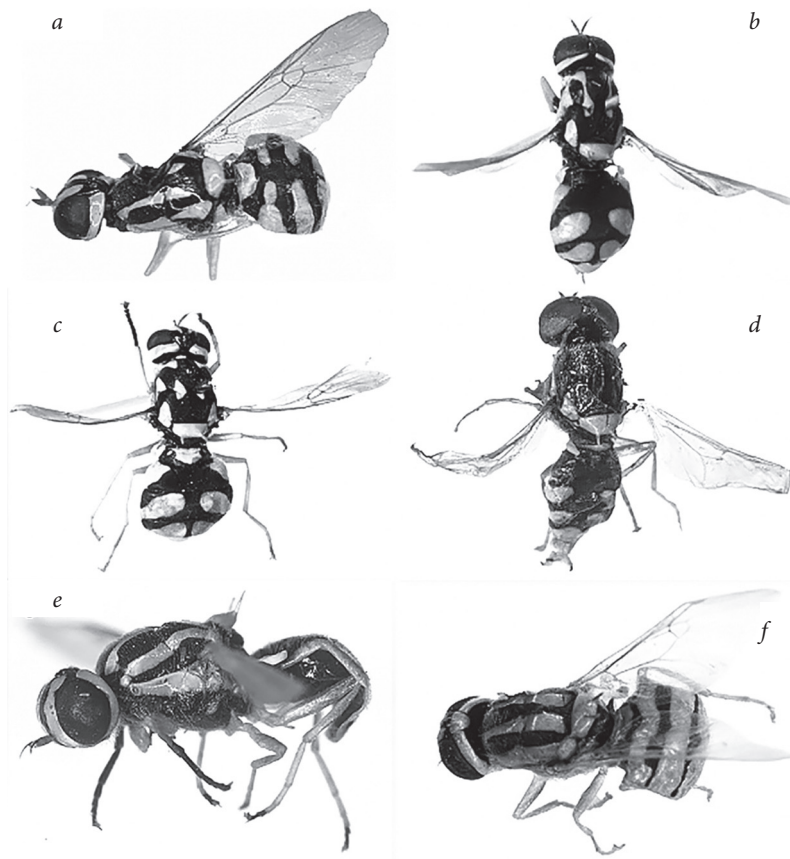


Fig. 2. *Oxycera fallenii*: female lateral view (a); *Oxycera meigenii*: male dorsal view (b), female dorsal view (c); *Oxycera notata*: male dorsal view (d), female lateral view (e), *Oxycera trilineata*: female dorsal view (f).

Remark: This species was originally described in the genus *Geitenomyia* Kertész, 1923, was only known from Azerbaijan and Turkey (Berezovsky, Nartshuk, 1993) and our record in Iran extended distribution localities of this very rare species.

***Oxycera fallenii*** Staeger, 1844\* (fig. 2, a)

Material examined: Iran, East Azerbaijan, Oskulu region (central part of Arasbaran forest): 38°53'12.26" N, 46°48'14.33" E, 1,859 m, 20.08.2010, 1 ♀ (Khaghaninia leg.).

Distribution: Central and Eastern Europe (Woodley, 2001), **first record for Iran.**

Remark: This species is only recorded from the Middle East from Turkey and it seems that this species is very rare in this region that is very likely due to the dry more desert conditions considering that the species has aquatic larvae.

***Oxycera meigenii*** Staeger, 1844 (fig. 2, b–c)

Material examined: Iran, East Azerbaijan, Mekidi valley (located in center of Arasbaran forest): 38°50'8.11" N, 46°54'3.15" E, 1656 m, 19.07.2011, 3 ♀, 1 ♂ (Khaghaninia leg.).

Distribution: Central and western parts of Europe, Afghanistan, Azerbaijan, Iran, Mongolia, Russia, Tajikistan, Turkey, Turkmenistan, Uzbekistan (Woodley, 2001).

Remark: In this species longitudinal yellow stripes on mesonotum present in both sexes and connected to humeral spots, in female abrupt at the middle; abdominal tergites 2–4 with oblique yellow side-markings (fig 2, b–c)

***Oxycera notata*** Loew, 1873\* (fig. 2, d–e)

Material examined: Iran, East Azerbaijan, Chichekli (located in western part of Arasbaran forest): N38°37'2.81" N, E46°26'8.93" E, 1534 m, 21.08.2012, 1 ♀, 1 ♂ (Khaghaninia leg.).

Distribution: Tajikistan (Woodley, 2001), **first record for Iran.**

Remark: male specimen of *O. notata* has tarsi completely yellow (fig. 2, d), but the original description of this species indicated that they have the last two or three tarsal segments darkened that is assumed to be a variable character. Fore tarsus of a female is entirely black and mid and hind tarsi yellow but last two tarsal segments are black (fig. 2, e)

***Oxycera trilineata*** (Linnaeus, 1767)\* (fig. 2, f)

Material examined: Iran, East Azerbaijan, Aynali Region (located in western part of Arasbaran forest): 38°55'12.08" N, 46°47'9.81" E, 1358 m, 14.06.2010, 3 ♀ (Khaghaninia leg.).

Distribution: West Palearctic (Woodley, 2001), **first record for Iran.**

Remark: Very distinguished species with abdomen green or yellow with a black pattern (fig. 2, f).

## Conclusion

The results show that the fauna of the soldier fly in Arasbaran Forests is surprisingly rich and more studies in the forests of northern Iran are promising for further studies of the insect fauna.

## References

- Berezovsky, V. V., Nartshuk, E. P. 1993. On the genus *Geitonomyia* with description of a new species from Azerbaijan and Turkey (Diptera: Stratiomyidae). *Zoosystematica Rossica*, 1, 97–101.
- James, M. T., McFadden, M. W. 1969. The genus *Adoxomyia* in America North of Mexico (Diptera: Stratiomyidae). *Journal of the Kansas Entomological Society*, 42, 260–276.
- James, M. T. 1965. Family Stratiomyidae. In: Stone, A., Sabrosky, C. W., Wirth, W. W., Foote, R. H., Coulson, J. R., eds. *A catalog of the Diptera of America North of Mexico*. Agricultural Research Service, United States Department of Agriculture, Washington D.C., 299–319.
- James, M. T. 1981. 36. Stratiomyidae. In: McAlpine J. F., ed. *Manual of Nearctic Diptera*. Research Branch Agriculture Canada, Ottawa, 497–511.
- Kazerani, F., Khaghaninia, S., Havaskary, M. 2012. First records of the subfamily Sarginae (Diptera: Stratiomyidae) from Iran. *Calodema*, 239, 1–6.
- Kazerani, F., Khaghaninia, S. 2013. The first record of the genus *Oplodontha* Rondani, 1863 (Diptera: Stratiomyidae) from Iran. *Far Eastern Entomologist*, 262, 1–6.
- Mason, F., Rozkošný, R., Hauser, M. 2009. A review of the soldier flies (Diptera: Stratiomyidae) of Sardinia. *Zootaxa*, 2318, 507–530.
- Kazerani, F., Khaghaninia, S. 2014. The first records of the subfamily Beridinae (Diptera: Stratiomyidae) from Iran. *Journal of Entomological and Acarological Research*, 46 (2), 70–76.
- McFadden, M. W. 1967. Soldier fly larvae in America North of Mexico. *Proceedings of the United States National Museum*, 121, 1–72.
- Nartshuk, E. P. 1988. 36. Family Stratiomyidae. In: Bei-Bienko, G. Ya., ed. *Keys to the Insects of the European Part of the USSR. Vol. V. Diptera and Siphonaptera. Part II*. Smithsonian Institution Libraries and the National Science Foundation, Washington, D.C, 701–738.
- Popescu-Mirceni, M., Parvu, C. 2009. Distributional data on some East–Mediterranean Brachycera (Diptera) [Results of the 'Euphrates' Expedition 2008, in Turkey and Syria]. *Travaux du Museum d'Historie Naturelle 'Grigore Antipa'*, 52, 429–436.
- Rozkošný, R. 1977. The West-Palaearctic species of *Nemotelus* Geoffroy (Diptera, Stratiomyidae). *Folia Facultatis Scientiarum Naturalium Universitatis Purkynianae Brunensis*, 17, 117–122.
- Rozkošný R. 1983. *A Biosystematic Study of the European Stratiomyidae (Diptera)*. Vol. 1. *Introduction, Beridinae, Sarginae and Stratiomyinae*. Dr. W. Junk Publishers, The Hague, 1–401.
- Rozkošný, R., Nartshuk, E. P. 1988. Family Stratiomyidae. In: Soos, A. Papp, L., eds. *Catalogue of Palaearctic Diptera, Vol. 5. Athericidae — Asilidae*. Akadémiai Kiado, Budapest; Amsterdam, 42–96.
- Rozkošný, R. 1998. *Chapter 24. Family Stratiomyidae. Manual of Palaearctic Diptera*. Science Herald Publishers, Budapest, 387–411.
- Rozkošný, R. 2004. Fauna Europaea: Stratiomyidae. Fauna Europaea: Diptera, Brachycera. In: Pape, T., ed. *Fauna Europaea*, version 1.1, <http://www.faunaeur.org>. Assigned 27.05.2014.
- Woodley, N. E. 2001. A world catalog of the Stratiomyidae (Insecta: Diptera). *Myia*, 11, 8. Backhuys Publishers, Leiden, 1–475.
- Woodley, N. E. 2011. A world catalog of the Stratiomyidae (Insecta: Diptera): A supplement with revisionary notes and errata. In: Thompson, F. C. Brake, I., Lonsdale, O., eds. *Contributions to the Biosystematic Database of World Diptera*. Pensoft Publishers and North America Dipterists Society, Sofia; Moscow; Washington D.C, 485–521.

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