Drosophilid flies (Diptera: Drosophilidae) of Georgia (Sakartvelo) with new records for the country

Maka Murvanidze¹, George Japoshvili², Nino Inasaridze¹, Ferenc Deutsch³

¹ I. Javakhishvili Tbilisi State University. I. Chavchavadze ave. 1. 0179 Tbilisi, Georgia
² Institute of Entomology, Agricultural University of Georgia, 240, D. Aghmashenebeli Alley, Tbilisi – 0131, Georgia
³ Centre for Agricultural Research, Plant Protection Institute, ELKH, Herman Ottó út 15. 1022, Budapest, Hungary

http://zoobank.org/16E06BF8-FB60-4B62-8EE7-73C88F7EFD31

Corresponding author: Maka Murvanidze (maka.murvanidze@tsu.ge)

Academic editor: Ximo Mengual ♦ Received: 1 June 2022 ♦ Accepted: 12 September 2022 ♦ Published: 25 October 2022

Abstract

Four genera and 12 species of drosophilid flies have been recorded during our survey in five regions of Georgia in 2021. Two genera, Amiota (Loew, 1862) and Gitona Meigen, 1830, and four species (Amiota subtusradiata Duda 1934, Drosophila busckii Coquillett 1901, D. kuntzei Duda, 1924, and Gitona distigma Meigen, 1830) represent new records for the fauna of Georgia (Sakartvelo).

Key words

Drosophila suzukii, Invasive, Pest, Inventory

Introduction

Drosophilidae is a family within the order Diptera, comprising 100 genera and 4473 species worldwide (Bánki et al. 2022). This group of insects is extremely understudied in the Caucasian Region (Gornostaev 1997), one of the globally important biodiversity hotspots (Myers et al. 2000; Williams et al. 2006). In their recent study about the Diptera of Georgia and Azerbaijan, Oboňa et al. (2019) summarized the existing information about the drosophilids in the Caucasus and indicated the presence of only eight species in Georgia belonging to five genera, i.e., Drosophila immigrans Sturtevant, 1921, D. simulans Sturtevant, 1919, D. suzukii (Matsumura, 1931), D. testacea von Roser, 1840, Leucophaea maculata (Dufour, 1839), Lordiphosa hexastich a (Papp, 1971), Scaptomyza graminum (Fallén, 1823), and Zaprionus tuberculatus Malloch, 1932.

Drosophila suzukii, one of the major fruit pest species world-wide, was first recorded in Georgia in 2017 (Japoshvili et al. 2018). In 2022, a countrywide monitoring project was initiated by the USAID Georgian Agriculture program and the National Food Agency of Georgia aiming to investigate the distribution of this invasive pest species, also known as the spotted wing drosophila (SWD). Along with the representatives of the target taxon, other drosophilid flies were also recorded. Monitoring was carried out in major agricultural regions of Georgia in orchards of susceptible crops to D. suzukii such as blueberries, strawberries, cherries, and grapes (Lee et al. 2012; Walsh et al. 2011). In the present work, we report the results of our findings with the updated data about the drosophilid diversity in Georgia and the new records for the country.

Material and methods

Study area

Study sites were distributed in the Adjara/Guria, Samegrelo, Imereti, Kartli, and Kakheti regions in order to cover the key host crop production areas for the SWD across Georgia. In each of these five regions, four monitoring sites of 2 hectares each were established with an in-between minimal distance of 5 km (Fig. 1, Table 1).
Trap placement and monitoring

In the monitoring sampling, PHEROCON® SWD traps with PHEROCON® SWD PEEL-PAK™ Broad Spectrum Lures (Trécé, Inc., Adair, OK, USA) were used from May to November 2021. Five traps were placed at each site, with four traps placed at the edges and one in the middle of the field as prescribed by the producer, with a distance between the traps of about 130 m. Traps were placed in the shaded areas of the host plant canopy and were checked for the presence of drosophilid flies once a week. Captured flies were extracted from traps using a fine paintbrush and stored in 95% alcohol for further treatment. Lures in each trap were changed once a month as prescribed by the producer company.

Laboratory procedures

Sampled flies were preliminary examined in the laboratory using a stereomicroscope UNITRON Z850 for identification. After identification, the voucher specimens were preserved in 70% ethanol and deposited at the laboratory of the Agricultural University of Georgia. The Drosophilid flies were subsequently identified by the last author using a stereomicroscope OLYMPUS SZ61 and the identification keys by Papp (1973) and Bächli et al. (2004). Specimens were also compared with the Diptera collection of the Hungarian Natural History Museum for species confirmation.

Results

A total of 12 species of drosophilid flies were sampled during the monitoring, belonging to four genera (Supplementary file 1: Table S1). An asterisk (*) in the species list indicates new records for the country. The number of the collected specimens is not indicated.

Samples were collected primarily thanks to the student helpers, whose names are indicated under each species as the following abbreviations: LJ-Luka Janjghava, KB-Konstantine Buchukuri, AK-Ani Kiria, SN-Sandro Narsia, MB-Mariam Beridze, SK-Salome Kalandadze, NM-Nana Mamulaishvili, NT-Nino Tkeshelashvili, LM-Lana Makalatia, KA-Khatia Areshidze, AA-Ana Amonashvili, MA-Mariam Aleksidze.

List of species

Family Drosophilidae Rondanin, 1856

Genus Amiota (Loew, 1862)*

- Amiota subtusradiata Duda, 1934*
  - GEORGIA • Narazeni; 15-Jul-2021; leg: AK, SN.
  - Distribution: Palaearctic.

- Drosophila busckii Coquillett, 1901*
  - GEORGIA • Melauri; 15-Jul-2021; leg: NT, KA, LM. Apnisi; 29-May-2021; leg: LJ, KB.
  - Distribution: Cosmopolitan.

- Drosophila immigrans Sturtevant, 1921
  - GEORGIA • Melauri; 15-Jul-2021; leg: NT, KA, LM. Melauri; 15-Jul-2021; leg: NT, KA, LM. Sazano; 15-Jul-2021; leg: NT, KA, LM. Kondoli; 15-Aug-2021; leg: AA, MA, MO. Shashiani; 15-Aug-2021; leg: AA, MA, MO.
  - Distribution: Cosmopolitan. Previous records in Georgia from Imereti region, Khanistskali River (Obona et al. 2019).

- Drosophila kuntzei Duda, 1924*
  - GEORGIA • Melauri; 15-Jul-2021; leg: NT, KA, LM. Kurdgelauri; 05-Jun-2021; leg: AA, MA, MO.
  - Distribution: Palaearctic.

- Drosophila melanogaster Meigen, 1830
  - GEORGIA • Narujo; 18-Jul-2021; leg: MB, SK, NM. Ingiri; 15-Jul-2021; leg: AK, SN. Skra; 08-Sep-2021; leg: LJ, KB. Mukuzani; 15-Aug-2021; leg: AA, MA, MO. Kondoli; 15-Aug-2021; leg: AA, MA, MO.
Table 1. List of the study sites with GPS coordinates and key crops where spotted wing Drosophila (SWD) traps were operated.

| Region        | Local names of study sites | GPS coordinates | Key crop          |
|---------------|----------------------------|-----------------|-------------------|
| Adjara        | Laituri                    | N41.9179° E41.8674° | Blueberry         |
| Guria         | Naruja                     | N41.9094° E41.9585° | Blueberry         |
|               | Natanebi                   | N41.9103° E41.7873° | Strawberry        |
|               | Tsetskhlauri               | N41.8787° E41.8737° | Blueberry         |
| Imereti       | Melauri                    | N42.1939° E42.3672° | Strawberry        |
|               | Obcha                      | N42.1269° E42.8965° | Vineyard          |
|               | Rokhi                      | N42.1167° E42.7201° | Vineyard          |
|               | Sazano                     | N42.1908° E43.0507° | Vineyard          |
| Kakheti       | Kondoli                    | N42.9607° E42.5967° | Vineyard          |
|               | Kurdgelauri                | N42.9521° E42.5922° | Vineyard          |
|               | Mukuzani                   | N41.8107° E41.71103° | Vineyard          |
|               | Shahiani                   | N42.8234° E41.66798° | Strawberry        |
| Kartli        | Agara                      | N43.2488° E43.79655° | Strawberry        |
|               | Apnisi                     | N43.99563° E43.90088° | Cherry            |
|               | Kvenartkotsa               | N43.04503° E43.83134° | Cherry            |
|               | Skra                       | N43.98481° E43.90614° | Cherry            |
| Samegrelo     | Ingiri                     | N42.47177° E42.79704° | Blueberry         |
|               | Narazeni                   | N42.42246° E42.92303° | Blueberry         |
|               | Rukhi                      | N42.53401° E41.87925° | Blueberry         |

- Distribution: Cosmopolitan. According to the Georgian biodiversity database (GBD), the species is known from Georgia. However, the occurrence was not checked by experts and the previous records can be considered doubtful (Tarkhnishvili and Chaladze 2013).

*D. phalerata* Meigen, 1830 *
- **GEORGIA** • Melauri; 15-Jul-2021; leg: NT, KA, LM. Shashiani; 05-Jun-2021; leg: AA, MA, MO.
- **Distribution**: Europe.

*D. simulans* Sturtevant, 1919
- **GEORGIA** • Naruja; 20-Sep-2021; leg: MB, SK, NM. Sazano; 15-Jul-2021; leg: NT, KA, LM. Kondoli; 15-Aug-2021; leg: AA, MA, MO. Shashiani; 15-Aug-2021; leg: AA, MA, MO. Kurdgelauri; 25-Sep-2021; leg: AA, MA, MO.
- **Distribution**: Cosmopolitan. Previous records from Georgia from Imereti Region (Ghvedi, Tskhinistskali River) and Shida Kartli Regions (Oboña et al. 2019).

*D. subsobcura* Collin, 1936
- **GEORGIA** • Apnisi; 29 May 2021; leg: LJ, KB. Shashiani; 15-Aug-2021; AA, MA, MO.
- **Distribution**: According to the GBD, this species is known from Georgia. However, the records were not checked by experts, and the occurrence might be doubtful (Tarkhnishvili and Chaladze 2013).

*D. suzukii* (Matsumura, 1931)
- **GEORGIA** • Laituri; 07-Jul-2021; leg: MB, SK, NM. Naruja; 07-Jul-2021; leg: MB, SK, NM. Natanebi; 07-Jul-2021; leg: MB, SK, NM. Tsetskhlauri; 11-Jul-2021; leg: MB, SK, NM. Melauri; 18-Jun-2021; leg: NT, KA, LM. Obcha; 22-Jul-2021; leg: NT, KA, LM. Rokhi; 02-Jul-2021; leg: NT, KA, LM. Sazano; 02-Jul-2021; leg: NT, KA, LM. Kondoli; 15-Aug-2021; leg: AA, MA, MO. Kurdgelauri; 04-Jul-2021; leg: AA, MA, MO. Mukuzani; 04-Jul-2021; leg: AA, MA, MO. Shashiani; 27-Jun-2021; leg: AA, MA, MO. Agara; 24-Oct-2021; leg: LJ, KB. Apnisi; 12-Jul-2021; leg: LJ, KB. Kvenartkotsa; 20-Sep-2021; leg: LJ, KB. Skra; 07-Aug-2021; leg: LJ, KB. Ingiri; 15-May-2021; leg: AK, AN. Narazeni; 13-Jun-2021; leg: AK, AN. Rukhi; 20-Jun-2021; leg: AK, AN.
- **Distribution**: Cosmopolitan (Walsh et al. 2011). Previous records from Georgia are from: Batumi (Japoshvil et al. 2018), Imereti (Ghvedi), Racha-Lechkumi and Kvemo Svaneti Regions (Tskhinistskali River near Durashi, and Tskhinistskali River near Makhashi) (Oboña et al. 2019).

D. testacea von Roser, 1840
- **GEORGIA** • Naruja; 18-Jul-2021; leg: MB, SK, NM. Laituri; 18-Jul-2021; leg: MB, SK, NM. Melauri; 15-Jul-2021; leg: NT, KA, LM. Obcha; 15-Jul-2021; leg: NT, KA, LM. Rokhi; 09-Jun-2021; leg: NT, KA, LM. Apnisi; 29-May-2021; leg: LJ, KB. Kurdgelauri; 05-Jun-2021; leg: AA, MA, MO. Mukuzani; 15-Aug-2021; leg: AA, MA, MO. Kondoli; 15-Aug-2021; leg: AA, MA, MO.
- **Distribution**: Palaeartic (Oboña et al. 2019). Species previously recorded from Kvemo Svaneti (Tskhinistskali River near Durashi) and Racha-Lechkumi Regions (Oboña et al. 2019).
plant protection Dr. Nikoloz Meskhi for overall support of the project. We also would like to thank to the students of I. Javakhishvili Tbilisi State University (Luka Janjghava, Konstantine Buchukuri, Ani Kiria), Agricultural University of Georgia (Sandro Nartsia), Batumi State University (Mariam Beridze, Salome Kalandadze, Nana Mamulaishvili), Kutaisi State University (Nino Tskeshelashvili, Lana Makalatia, Kharia Areshidze), Télati State University (Ana Amonashvili, Mariam Alekisdze, Mariam Onikashvili) and their supervisors (Dr. Lali Jgenti, Dr. Maka Khetsuriani, Dr. Magda Davitashvili) for participation in the field works. We also express our gratitude to anonymous reviewers and Dr. Ximo Mengual and Dr. Levan Mumladze for revising the text and providing valuable comments.

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Supplementary material

Table S1. Presence/absence data of drosophilid flies (Diptera: Drosophilidae) in Georgia

| Authors                  | Maka Murvanidze, George Japoshvili, Nino Inasaridze, Ferenc Deutsch |
|--------------------------|-------------------------------------------------|
| Data type                | .xlsx                                          |
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