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New records of Diptera families Anisopodidae, Bibionidae, Dixidae, Ptychopteridae and Scatopsidae from Armenia

(Diptera)

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First records of 12 species of the Diptera families: Anisopodidae, Bibionidae, Dixidae, Ptychopteridae, and Scatopsidae from Armenia are presented together with the first checklist of these families from this area. The species richness of the anisopodid fauna in Armenia currently comprises 2 species, the bibionid fauna 3 species, the dixid fauna 3 species and the ptychopterid fauna 2 species. The scatopsid diversity is listed here with 3 species. This constitutes the first record of this family for Armenia and Transcaucasia as a whole.

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Introduction

The Caucasus region is one of the WWF Global 200 ecoregions. It belongs to the most outstanding terrestrial, freshwater, and marine habitats, and is designed to serve as a blueprint for biodiversity conservation at a global scale. The Caucasus is also among the top 25 biologically richest and most endangered hotspots in the world – the “biodiversity hotspots” – with an exceptional concentration of endemic species and species at risk (Kremer et al. 2001, Myers et al. 2000). The remarkable richness

of the flora and fauna is determined by complex orography, geology and climate resulting in a variety of different habitats, landscapes and microclimates of this mountain island situated at the border of Europe and Asia at the junction of the temperate and sub-tropical zones. This area is affected by both, Atlantic air masses and the dry continental climate of continental Eurasia (Price 2000). The territory of the Republic of Armenia is a small part of the Caucasus (29740 km²) and is an overlapping and bordering area of several biogeographic units. On the other hand, this country shows very high biodiversity with

an estimated number of more than 17000 species of invertebrates (Fayvush et al. 2013). The specificity of this area creates favourable conditions for various entomological research studies. However, several fly families have not been well studied in the Caucasus, even less in Armenia.

Information on the family Ptychopteridae from Caucasus is given in Joost (1978), Zwick (1988), Krzemiński & Zwick (1993), and Paramonov (2004). Based on larvae identification the family Dixidae is reported from the northern slopes of the Central Caucasus in Khazeeva (2010) and Jakimov (2015). From the whole of Transcaucasia only one species of the family Anisopodidae was published by Krivosheina & Menzel (1998). The knowledge on Bibionidae was summarised by Krivosheina (1969). This area remained practically "terra incognita" for other families (e.g. Scatopsidae).

In a recent sampling campaign, we collected individuals belonging to these five families from 16 sites in the north-western part of Armenia. Due to the noticeable lack of information on these families in this area, the aim of the present paper is 1) to summarise new and literary data of five Diptera families (Anisopodidae, Bibionidae, Dixidae, Ptychopteridae, and Scatopsidae) from Armenia, 2) to publish the first checklists of these five Diptera families of Armenia.

Material and methods

Samples were collected by sweep netting from vegetation around the north-western Armenian streams and lakes (Table 1, Figs 1, 2) from August 26 to September 4, 2015 by J. Oboňa, L. Hrivniak and P. Manko. Obtained material was preserved in 75 % ethanol in the field. In the laboratory, all specimens listed here were dried, pinned, glued onto points or still preserved in alcohol, identified and deposited in the collections of the authors.

Anisopodidae and Bibionidae were identified by L. Dvořák using Söli & Rindal (2014) and Krivosheina (1969). Anisopodidae material is deposited in the collection of the Municipal Museum Mariánské Lázně, Czech Republic and Bibionidae material is deposited in the private collection of L. Dvořák. Dixidae and Ptychopteridae were identified based on Disney (1999) and Krzemiński & Zwick (1993) by J. Oboňa. The material is deposited in the Laboratory and Museum of Evolutionary Ecology, Department of Ecology, University of Prešov. Scatopsidae samples were identified by J.-P. Haenni using Haenni (1997). The material is deposited in Muséum d'Histoire Naturelle, Neuchâtel, Switzerland.

Results

Check list for Armenia

Anisopodidae

Sylvicola cinctus (Fabricius, 1787)

Sylvicola stackelbergi Krivosheina & Menzel, 1998

Bibionidae

Dilophus febrilis (Linnaeus, 1758)

Dilophus bispinosus Lundström, 1913

Bibio consanguineus Loew, 1869

Dixidae

Dixa submaculata Edwards, 1920

Dixa puberula Loew, 1849

Dixella obscura (Loew, 1849)

Ptychopteridae

Ptychoptera alina Krzemiński & Zwick, 1993

Ptychoptera contaminata (Linnaeus, 1758)

Scatopsidae

Reichertella nigra (Meigen, 1804)

Efcokella albitarsis (Zetterstedt, 1850)

Swammerdamella brevicornis (Meigen, 1830)

Apiloscatopse sp.

Faunistic records

Family Anisopodidae

(L. Dvořák det.)

Anisopodidae known as wood gnats or window-gnats are medium-sized (5–10 mm), usually orange to light brown coloured Nematocera with elongated body and legs. The larvae are found in various decaying organic materials such as the stems and roots of umbelliferous plants. The adults occur mainly in forest habitats, but frequently also in gardens or on windows in houses; they feed on nectar and other liquids. Altogether 10 species are known from the Western Palaearctic region (de Jong 2013). Only one species, *Sylvicola cinctus* (Fabricius, 1787), was published from Transcaucasia (Krivosheina & Menzel 1998).

Sylvicola cinctus (Fabricius, 1787)

Material examined: Lori, small steppe brook, Dzoraget River (site 10), 2.ix.2015, 1♂.

Distribution and remarks: First report for Armenia. A widespread and common West Palaearctic species, known from almost the whole of Europe (de Jong 2013, Krivosheina & Menzel 1998). This species was known from Azerbaijan and the Russian Caucasus (Krivosheina & Menzel 1998).

***Sylvicola stackelbergi* Krivosheina & Menzel, 1998**

Material examined: Tavush, W of Dilijan City, Bldan River (site 16), 28.viii.2015, 1♀.

Distribution and remarks: First report for Armenia and Transcaucasia as a whole. *S. stackelbergi* is known mainly from northern Europe (Estonia, Finland, Sweden, central, northern, and northwestern Russia), with one record from western Europe (Netherlands) and two records from central Europe (Slovakia and Austria) (Ševčík 2011, Dvořák 2014). The Armenian record extends the known distribution of this species considerably to the south-east.

Family Bibionidae

(L. Dvořák det.)

Bibionidae are small to large nematocerous flies with a strong sexual dimorphism that is evident in both the morphology (eyes holoptic in males, broadly separated in females) and the colour. Bibionids are robust flies with a setose body, swollen fore femur, and fore tibia armed with a series of spines (*Dilophus*) or strong apical spurs (*Bibio*). The phytosaprophagous larvae develop in decaying vegetable matter or leaf litter,

and some species may become pests of crops while feeding on the roots of grasses and subterranean parts of plants. Altogether 49 species are known from Europe including the Caucasus (Krivosheina 1969, Skartveit 2013). The knowledge on Bibionidae of the former USSR was summarised by Krivosheina (1969), who lists only four species of Bibionidae from the Caucasus: *Dilophus febrilis* (Linnaeus, 1758), *Bibio consanguineus* Loew, 1869, *B. hortulanus* (Linnaeus, 1758), and *B. marci* (Linnaeus, 1758).

***Dilophus febrilis* (Linnaeus, 1758)**

Material examined: Kotayk, SW of Hrazdan Reservoir, Hrazdan River (site 3), 27.viii.2015, 1♀, 1♂; Tavush, W of Dilijan City, Bldan River (site 16), 28.viii.2015, 1♂; Shirak, at the shepherd's abode, small steppe brook, Akhurian River (site 12), 2.ix.2015, 4♂; Lori, in the valley at the road H23 to the Pushkin pass, small brook (site 9), 3.ix.2015, 1♀, 1♂.

Distribution and remarks: Widely distributed species occurring in the whole of Europe with records from Transcaucasia and the mountains of central Asia (Krivosheina 1969).

***Dilophus bispinosus* Lundström, 1913**

Material examined: Tavush, nr. Gosh Village, Gosh brook (site 14), 4.ix.2015, 1♂.

Distribution and remarks: First report for Armenia and Transcaucasia as a whole. A rare thermophilous species known from western, central, and southern Europe. Recently published from Turkey (Skartveit & Koç 2007) and Israel (Skartveit & Kaplan 1996).

Table 1. Sampling sites in Armenia.

Site No.	Site name (province, short description of localisation)	Latitude/ N	Longitude/ E	Altitude/ m a.s.l.
1	Ararat Province, NE of Garni Temple, Gekhard River	40°07'00.4"	44°44'35.7"	1340
2	Kotayk Province, below Hankavan, Marmarik River	40°38'04.7"	44°29'19.4"	1974
3	Kotayk Province, SW of Hrazdan Reservoir, Hrazdan River (Fig. 2a)	40°29'12.8"	44°43'55.9"	1705
4	Kotayk Province, N of Meghradzor Village, Marmarik River	40°37'53.0"	44°40'17.5"	1870
5	Kotayk Province, NE of Meghradzor Village, Marmarik River	40°37'12.7"	44°40'18.3"	1825
6	Kotayk Province, nr. Artavaz Village, Marmarik River	40°36'49.9"	44°34'18.2"	1849
7	Kotayk Province, S of Marmarik Village, Marmarik River	40°33'52.0"	44°40'09.1"	1872
8	Lori Province, E of Lermontov Village, Aghstev River	40°45'24.6"	44°38'42.0"	1853
9	Lori Province, in the valley at the road H23 to the Pushkin pass, small brook	40°54'22.9"	44°25'33.3"	1839
10	Lori Province, small steppe brook, Dzoraget River	41°03'59.9"	44°05'44.2"	1949
11	Shirak Province, at the H31 road, small steppe brook (Fig. 2b)	41°01'44.0"	44°01'29.1"	2310
12	Shirak Province, at the shepherd's abode, small steppe brook, Akhurian river	41°00'20.1"	43°59'14.1"	2286
13	Tavush Province, E of Haghartsin, tributary of Aghstev River (Fig. 2c)	40°48'09.3"	44°53'43.7"	1382
14	Tavush Province, nr. Gosh Village, Gosh brook	40°44'15.9"	45°01'01.2"	1039
15	Tavush Province, NW of Teghut City, tributary of Aghstev River	40°47'15.2"	44°54'58.0"	1197
16	Tavush Province, W of Dilijan City, Bldan River	40°44'49.1"	44°49'03.5"	1354

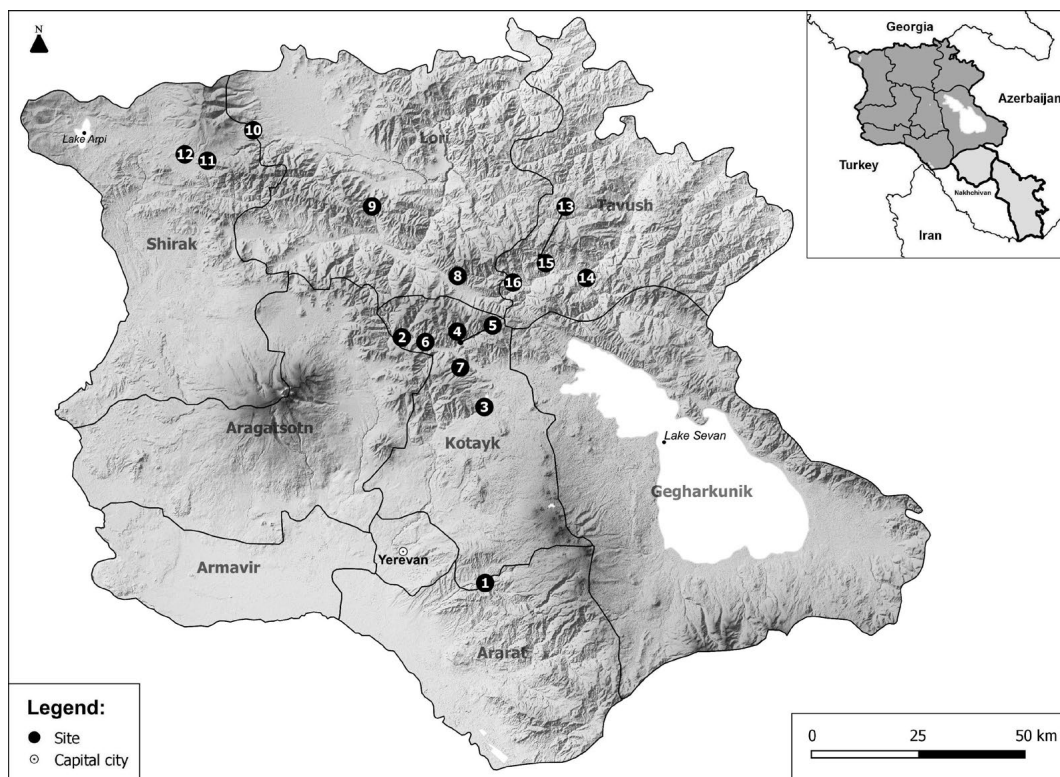


Fig. 1. Map showing all collecting sites in Armenia.

Bibio consanguineus Loew, 1869

Material examined: Kotayk, below Hankavan, Marmarik River (site 2), 26.viii.2015, 2♀; Tavush, E of Haghartsin, tributary of Aghstev River (site 13), 29.viii.2015, 1♀; Shirak, at the shepherd's abode, small steppe brook, Akhurian River (site 12), 2.ix.2015, 2♀.

Distribution and remarks: Known from southern Russia, Caucasus, Altai, eastern Siberia, and the Far East (Krivosheina 1969).

Family Dixidae (J. Oboňa det.)

Dixidae or meniscus midges are medium-sized (4–8 mm), yellowish to dark brown nematoceran midges, characterized by a wing venation with 2 forks. Larvae of meniscus midges dwell in or slightly above the water meniscus, having a characteristic U-shaped position (Wagner 1997). Members of the genus *Dixella* are associated with lentic or slow flowing waters, such as ponds, lake shores and bog pools. Species of the genus *Dixa* are lotic, dwelling in

running waters of varying size (Disney 1999). About 67 species occur in the Palaearctic region (Wagner et al. 2008). From northern slopes of the Central Caucasus, as far as is known to the authors, only three species were reported on the basis of larvae identification: *Dixella amphibia* (De Geer, 1776) (Khazeeva 2010), *Dixa submaculata* Edwards, 1920 and *D. frizzi* (Contini, 1965) (Jakimov 2015). However, because of uncertainties of larvae identification (Wagner 2004), their occurrence needs to be confirmed by records of adult specimens.

Dixa submaculata Edwards, 1920

Material examined: Kotayk, S of Marmarik Village, Marmarik River (site 7), 27.viii.2015, 5♂; Tavush, W of Dilijan City, Bldan River (site 16), 28.viii.2015, 5♂; Tavush, NW of Teghut City, tributary of Aghstev River (site 15), 29.viii.2015, 2♂; Ararat, NE of Garni Temple, Gekhard River (site 1), 31.viii.2015, 1♂.

Distribution and remarks: First report for Armenia. Known from Europe, Turkey (Koç et al. 2006, Wagner 2015) and, based on larvae identification, from Russian Caucasus (Jakimov 2015).



Fig. 2. Examples of different sampling site types. **a.** Site No. 3: SW of Hrazdan Reservoir, Hrazdan River; **b.** site No. 11: at the H31 road, small steppe brook; **c.** site No. 13: E of Haghartsin, tributary of Aghstev River.

Dixa puberula Loew, 1849

Material examined: Kotayk, nr. Artavaz Village, Marmarik River (site 6), 27.viii.2015, 2♂; Tavush, E of Haghartsin, tributary of Aghstev River (site 13), 29.viii.2015, 5♂; Lori, E of Lermontov Village, Aghstev River (site 8), 1.ix.2015, 7♂.

Distribution and remarks: First report for Armenia and Transcaucasia as a whole. Known from Europe (Wagner 2015).

Dixella obscura (Loew, 1849)

Material examined: Kotayk, NE of Meghradzor Village, Marmarik River (site 5), 27.viii.2015, 2♂.

Distribution and remarks: First report for Armenia and Transcaucasia as a whole. Known from Europe and North Russia (Wagner 2015).

Family Ptychopteridae

(J. Oboňa det.)

This family comprises slender flies of moderate size and tipuloid appearance. The adults frequent the muddy banks of streams and pools, marshes of various types, and similar habitats. The larvae are aquatic or semiaquatic, inhabiting saturated mud and feeding on decaying vegetable matter (Zitek-Zwyrtek 1971). Altogether 27 species occur in the Palaearctic region (Wagner et al. 2008), from Transcaucasia 5 species are known: *Ptychoptera alina* Krzemiński & Zwick, 1993, *P. contaminata* (Linnaeus, 1758), *P. lacustris* Meigen, 1830, *P. peusi* Joost, 1974, and *P. scutellaris* Meigen, 1818 (Joost 1978, Krzemiński & Zwick 1993, Paramonov 2004). From Armenia only one of them *Ptychoptera alina* Krzemiński & Zwick, 1993 was published (Krzemiński & Zwick 1993).

Ptychoptera contaminata (Linnaeus, 1758)

Material examined: Kotayk, SW of Hrazdan Reservoir, Hrazdan River (site 3), 27.viii.2015, 6♂, 4♀.

Distribution: First report for Armenia. Known from Europe, Russia, Dagestan Republic, Kazakhstan, and Turkey (Zwick 1988, Krzemiński & Zwick 1993).

Family Scatopsidae (J.-P. Haenni det.)

Scatopsidae are tiny nematoceran midges (body size 0.5–4.0 mm) occurring in various environments. Immature stages are saprophagous, developing in a wide variety of decaying organic material of both animal and vegetal origin. About 110 species are known from the West Palaearctic (Haenni 2013) but several areas still wait for description of the Scatopsidae fauna. Armenia (and Transcaucasia as a whole) has never been investigated for this family and, as far as is known to the authors, there is not even any published record of Scatopsidae from the Caucasus.

Reichertella nigra (Meigen, 1804)

Material examined: Kotayk, SW of Hrazdan Reservoir, Hrazdan River (site 3), 27.viii.2015, 1♀.

Distribution and remarks: First report for Armenia and Transcaucasia as a whole. A widespread and common west Palaearctic species presently known from most of Europe, as far east as Lithuania and Greece. The Armenian record extends the known distribution of this species considerably to the east. Immature stages unknown.

Efcokella albitarsis (Zetterstedt, 1850)

Material examined: Lori, small steppe brook, Dzoraget River (site 10), 2.ix.2015, 1♂, 1♀; Shirak, at the H31 road, small steppe brook (site 11), 2.ix.2015, 1♂.

Distribution and remarks: First report for Armenia and Transcaucasia as a whole. A common species in open habitats, widespread in Europe (except the Mediterranean), as far east as NW Russia, Slovakia and Hungary. The Armenian record extends the known distribution of this species considerably to the south-east. Immature stages undescribed, but larvae have been reared from dung of small rodents and cow according to Skidmore (2010).

Swammerdamella brevicornis (Meigen, 1830)

Material examined: Kotayk, N of Meghrazzor Village, Marmarik River (site 4), 27.viii.2015, 1♀.

Distribution and remarks: First report for Armenia and Transcaucasia as a whole. A West Palaearctic species known from the whole of Europe, North Africa, the Middle East, and Central Asia. One of the commonest West Palaearctic scatopsids, present

in a wide variety of environments. Immature stages still unknown.

Apiloscatopse sp.

Material examined: Shirak, at the H31 road, small steppe brook (site 11), 2.ix.2015, 1♂, 2♀.

Distribution and remarks: These specimens belong to a distinctive new species that will be described elsewhere. It seems to be more closely related to *A. fuscohalterata* (Duda, 1928) from the mountains of Montenegro. Interestingly these specimens have been caught by sweeping in a steppe environment (Fig. 2b), while nearly all known Palaearctic species of the genus (except for two of them) are bound to wooded areas.

Discussion

These results represent certainly only a small part of the Armenian fauna of the families Anisopodidae, Bibionidae, Dixidae, Ptychopteridae, and Scatopsidae. The fact that even the finding of common and wide spread species such as *Sylvicola cinctus*, *Dilophus febrilis*, *Dixa submaculata*, *D. puberula*, *Dixella obscura*, *Ptychoptera contaminata*, *Reichertella nigra*, *Efcokella albitarsis*, and *Swammerdamella brevicornis* constitute first records for the country shows how poorly the fauna is yet explored. For several of the species and the entire family Scatopsidae this is the first record for Transcaucasia as a whole.

It is important to know species distribution for studying biogeography and to undertaking effective conservation of biodiversity actions. The first list of species and notes on the geographic distribution of five dipteran families for Armenia, a highly neglected biodiversity hotspot of Transcaucasia, is presented above. This checklist will provide a baseline for further studies and for initiation of serious conservation actions in this country.

Of special interest is the discovery of an additional, still undescribed species of the genus *Apiloscatopse*. No doubt that future collecting in Armenia or other countries of the region will yield other interesting faunistic novelties.

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