Forest Long-legged flies (Diptera: Dolichopodidae) from the park of the Forest Research Institute with new records for Bulgaria and notes on habitat affinity

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Abstract
The paper gives information for 17 dolichopodid species collected from the park of the Forest Research Institute, Sofia. Two species (Lamprochromus kowarzi and Syntornon pseudospicatum) are recorded as new for the fauna of Bulgaria. Habitat preferences of the identified species are discussed. Two species dominate the study area: Hercostomus nanus dominates from early June to mid-July and then Sybistroma obscurellus dominates from mid-July to the second half of October.

Keywords
Diptera, Dolichopodidae, Bulgaria, new records, fauna

Introduction
The family Dolichopodidae (or long-legged flies) encompasses small- to middle- sized species (1 to 10 mm). Most of the species are predators and feed on other insects or their larvae, mites, worms, etc. The body is most often metallic green but in some species it is yellow or blue. About 8 000 different species are described worldwide. There are no known species from Antarctica. In Bulgaria 195 species are known (Kechev et al., 2020).
The main purpose of this work is to give information about species diversity from the investigated wooded area, including new records and notes about habitat preferences of the identified species.

Material and Methods

The material for the current work was collected from the park of the Forest Research Institute, Bulgarian Academy of Sciences in Sofia (Fig. 1). The insects were collected by means of sweep net. The faunistic list includes the following information: species, data of collecting and number of specimens. For the determination of dolichopodids was used literature by Parent (1938), d’Assis Fonseca (1978), Grichanov (2007) and Negrobov, Stackelberg (1969). For species of Lamprochromus were used works by Drake (2017) and Grichanov, Ahmadi (2017). For the distribution was used literature by Negrobov (1991), Grichanov (2007, 2014) and Pollet (2011).

Vegetation data

The taxonomic nomenclature of plant species follows mainly Delipavlov, Cheshmedzhiev (2003) and, if necessary, references are made to the synonymy of the species in The Plant List (2020). The affiliation of individual species to certain ecological groups of plants is according to Pavlov (1998, 2006) and scientific web sites Plantarium (2020) and Tela Botanica (2020). The abbreviations of the ecological groups according to the soil humidity are: Hg – hygrophytes, Hl – helophytes, Hd – hydrophytes, Mf – mesophytes, Mx – mesoxerophytes, Hm – hygromesophytes, Xe – xerophytes. The abbreviations of the ecological groups by their affiliation to sunlight are: He – heliophytes, Hp – hypoheliophytes, Sc – sciophytes, Sh – hemisciophytes. The cover abundance of the species is presented in a percentage scale (Pavlov, 2006).

Site 1

Site 1 was located on the border between the forested and the open part of the forest park. This site hosted representatives of the hydro- and hygrophilous vegetation in the water-occupied area of the fountain and mesophilic plant species in its immediate vicinity. The data on the floristic composition and the cover abundance of the species are presented in Table 1.

The composition of the plant community at Site 1 included 16 species from 14 genera and 13 families. Most were members of the family Oleaceae – three species. Trees were represented by six species (37.6% of the species), shrubs – by three species (18.8%) and herbaceous plants – by seven species (43.8%). In terms of soil humidity affiliation, mesophytes had the largest species participation in the communities – eight species (50%), followed by xeromesophytes – four species (25%), hydrophytes – two species (12.5%), hygro- and xerophytes – one type (6.3%). The hydrophytic species Sagittaria latifolia had the largest cover abundance, followed by the mesophytic Hedera helix. Among the ecological groups of plants distributed by the sunlight factor, the heliophytes of the open...
spaces predominated – seven species (43.8%) and the hypoheliophytes under the canopy of the tree floor – six (37.6%). With the greatest cover abundance was the shade-tolerant species *Hedera helix*.

**Site 2**

The site was located inside the forest park on both sides of the channel. It was characterised by a high cover abundance of trees (first layer) – 85.0%. The species composition was poorer than that at Site 1 (Table 2). It consisted of six species belonging to five genera and five families, most of which participated in floors 1 and 2. The herb layer was occupied by a monodominant population of ivy. The distribution of the ecological groups according to the water regime was in favour of the mesophytes – four species (66.7%), followed by the xeromesophytes – two species (33.4%). No hygro- and hydrophytes were observed in this sample area. The distribution of the ecological groups in relation to the affinity of the species for light was dominated by hemisciophytes – three species (50.0%), followed by hypoheliophytes – two species (33.4%) and sciophytes (16.7%).

### Table 1. Floristic composition and projective cover of the species at Site 1

| Species                        | Family            | Cover abundance | Ecological group according to the soil humidity | Ecological group according to the sunlight |
|-------------------------------|-------------------|-----------------|-----------------------------------------------|-------------------------------------------|
| *Pterocarya stenoptera* C. DC. | Juglandaceae      | 20%             | Mf                                            | He                                        |
| *Quercus cerris* L.           | Fagaceae          | 20%             | Xe                                            | He                                        |
| *Fallopia X bohemica* (Chrtek & Chrtková) J. P. Bailey | Polygonaceae      | 20%             | Mf                                            | He                                        |
| *Prunus avium* (L.) L.        | Rosaceae          | 5%              | Mf                                            | Hp                                        |
| *Prunus cerasifera* Ehrh.     | Rosaceae          | 10%             | Xm                                            | Hp                                        |
| *Cornus sanguinea* L.         | Cornaceae         | 1-5%            | Xm                                            | Hp                                        |
| *Clematis vitalba* L.         | Ranunculaceae     | 1-5%            | Mf                                            | Hp                                        |
| *Fraxinus ornus* L.           | Oleaceae          | 10%             | Xm                                            | Hp                                        |
| *Ligustrum vulgare* L.        | Oleaceae          | 1-5%            | Xm                                            | Sh                                        |
| *Hedera helix* L.             | Araliaceae        | 25%             | Mf                                            | Sh                                        |
| *Fraxinus pennsylvanica* Marshall | Oleaceae        | 1-5%            | Mf                                            | He                                        |
| *Vinca minor* L.              | Apocynaceae       | 10%             | Mf                                            | Hp                                        |
| *Sagittaria latifolia* Willd. | Alismataceae      | 30%             | Hd                                            | He                                        |
| *Phalaris arundinacea* L.     | Poaceae           | 10%             | Hd                                            | He                                        |
| *Lythrum salicaria* L.        | Lythraceae        | 1%              | Mf                                            | He                                        |
| *Carex sp.*                   | Cyperaceae        | <1%             | Hg                                            | Sh                                        |
Table 2. Floristic composition and cover abundance of the species at Site 2

| Species              | Family       | Cover abundance | Ecological group according to the soil humidity | Ecological group according to the sunlight |
|----------------------|--------------|-----------------|-----------------------------------------------|--------------------------------------------|
| Total coverage of the layer 1 - 85% |
| *Tilia platyphyllos* Scop. | Tiliaceae    | 45%             | Mf                                            | Sc                                         |
| *Acer pseudoplatanus* L. | Aceraceae    | 30%             | Xm                                            | Sh                                         |
| *Mespilus germanica* L.  | Rosaceae     | 10%             | Mf                                            | Hp                                         |
| Total coverage of the layer 2 - 55% |
| *Cornus mas* L.         | Cornaceae    | 5%              | Xm                                            | Hp                                         |
| *Acer campestre* L.      | Rosaceae     | 5%              | Mf                                            | Sh                                         |
| Total coverage of the layer 3- 70% |
| *Hedera helix* L.       | Araliaceae   | 70%             | Mf                                            | Sh                                         |

Results

Subfamily DIAPHORINAE

*Argyra leucocephala* (Meigen, 1824)
Material examined: 18.09.2020, 2 males; 21.09.2020, 3 males, 4 females; 28.09.2020, 1 male; 02.10.2020, 1 male.
Distribution: Europe (Negrobov, 1991; Pollet, 2011), North Africa: Algeria, Tunisia (Grichanov, 2007).

*Chrysotus cilipes* Meigen, 1824
Material examined: 11.09.2020, 1 male, 1 female.
Distribution: Europe (Negrobov, 1991; Pollet, 2011), Abkhazia, Armenia, Azerbaijan, Russia: Kabardino-Balkaria, Krasnodar, Rostov; Transpalearctic species (Grichanov, 2007).

*Chrysotus femoratus* Zetterstedt, 1843
Material examined: 01.09.2020, 1 male; 11.09.2020, 1 male, 2 females.
Distribution: Europe (Negrobov, 1991; Pollet, 2011), North Africa: Algeria, Tunisia (Grichanov, 20014).

*Chrysotus gramineus* (Fallén, 1823)
Material examined: 18.09.2020, 1 male.
Distribution: Europe (Negrobov, 1991; Pollet, 2011), Armenia; Azerbaijan; Georgia; Russia: Kabardino-Balkaria; Transpalearctic species (Grichanov, 2007).

Subfamily DOLICHOPODINAE

*Dolichopus griseipennis* Stannius, 1831
Material examined: 08.06.2020, 1 male.
Distribution: Europe (Negrobov, 1991; Pollet, 2011); North Africa: Algeria; Middle Asia (Grichanov, 2007).

*Dolichopus* sp.
Material examined: 17.07.2020, 2 females.
**Hercostomus nanus** (Macquart, 1827)
Material examined: 08.06.2020, 6 males, 3 females; 15.06.2020, 11 males, 7 females; 22.06.2020, 6 males, 5 females; 29.06.2020, 4 males, 3 females; 02.07.2020, 2 males, 2 females; 06.07.2020, 2 males, 1 female.
Distribution: Europe (Negrobov, 1991; Pollet, 2011).

**Sybistroma nodicornis** Meigen, 1824
Material examined: 08.06.2020, 1 male, 1 female; 15.06.2020, 1 male, 1 female; 29.06.2020, 1 male, 2 females.
Distribution: Europe (Negrobov, 1991; Pollet, 2011), Asia: Iraq; North Africa: Egypt (Grichanov, 2007).

**Sybistroma obscurellus** (Fallén, 1823)
Material examined: 17.07.2020, 3 males; 06.08.2020, 2 males; 01.09.2020, 3 males; 08.09.2020, 1 male, 1 female; 11.09.2020, 4 males, 2 female; 14.09.2020, 3 males, 2 female. 28.09.2020, 2 male; 02.10.2020, 4 males, 2 females; 12.10.2020, 4 males, 1 female.
Distribution: Europe (Negrobov, 1991; Pollet, 2011); Russia: Adygea, Krasnodar (Grichanov, 2007).

**Subfamily RHAPHIINAE**

**Rhaphium appendiculatum** Zetterstedt, 1849
Material examined: 08.09.2020, 1 male, 2 females; 21.09.2020, 1 male.
Distribution: Europe (Negrobov, 1991; Pollet, 2011), Abkhazia, Georgia, Russia: Alania, Krasnodar, Ural; Middle Asia: Iran, Afghanistan; North Africa: Algeria, Morocco (Grichanov, 2007).

**Rhaphium caliginosum** (Meigen, 1824)
Material examined: 03.06.2020, 1 female; 08.09.2020, 1 male, 1 female; 18.09.2020, 1 male, 1 female.
Distribution: All Europe (Negrobov, 1991; Pollet, 2011), Algeria, Armenia, Azerbaijan, Israel, Morocco, Syria, Turkey (Grichanov, 2007); Russia: Krasnodar, Kabardino-Balkaria, Karachai-Cherkessia, Rostov, Stavropol, Ural, Baikal, Primorskii Terr.; Israel, Syria, Turkey; Algeria, Morocco (Grichanov, 2007).

**Subfamily SCIAPODINAE**

**Sciapus** sp.
Material examined: 22.06.2020, 1 female.

**Subfamily SYMPYCNINAE**

**Campsicnemus curvipes** (Fallén, 1823)
Material examined: 02.07.2020, 2 males; 17.07.2020, 3 males, 1 female; 14.08.2020, 1 male, 1 female; 18.08.2020, 1 male; 08.09.2020, 1 female; 02.10.2020, 1 male.
Distribution: All Europe (Negrobov, 1991; Pollet, 2011); Canary Islands; Algeria, Madeira, Morocco (Grichanov, 2007).

**Lamprochromus kowarzi** Negrobov et Tshalaja, 1988
Material examined: 17.07.2020, 1 male.
**Site 1. Old fountain**

42°37’49.90" N
23°21’41.14" E

638 m a.s.l.

**Site 2. Brook**

42°37’49.99" N
23°21’16.67" E

637 m a.s.l.

**Figure 1.** Places of collection. A, B – trees and grasses around the old fountain; C – old fountain; D – trees above the brook; E – brook
Distribution: Azerbaijan, Israel, Russia (Chechnya), Slovakia (Grichanov, Ahmadi, 2017), Britain (Drake, 2017).

Note: First record for Bulgaria.

**Sympycnus pulicarius** (Fallén, 1823)

Material examined: 03.06.2020, 1 male; 14.08.2020, 1 male; 18.08.2020, 1 male.

Distribution: All Europe (Negrobov, 1991; Pollet, 2011); Russia: Alania, Kabardino-Blakaria, Karachai-Cherkessia, Stavropol; Nearctic: California (Grichanov, 2007).

**Syntormon pallipes** (Fabricius, 1794)

Material examined: 22.06.2020, 2 males, 1 female; 12.10.2020, 1 male.

Distribution: All Europe (Negrobov, 1991; Pollet, 2011); Algeria, Egypt, Iran, Iraq, Israel, Jordan, Morocco, Tunisia, Turkey; Oriental realm: China; Afrotropical: Yemen, Saudi Arabia (Dawah et al., 2020).

**Syntormon pseudospicatum** Strobl, 1899

Material examined: 22.06.2020, 1 male; 11.09.2020, 1 male; 21.09.2020, 1 male, 1 female; 02.10.2020, 1 male.

Distribution: Britain, Greece, France and Spain (Drake, 2020).

Note: First record for Bulgaria.

Discussion

*Lamprochromus kowarzi* and *Syntormon pseudospicatum* are recorded as new to the fauna of Bulgaria. *Syntormon pseudospicatum* is morphologically close to the species S. *pallipes*. It is very likely that this species has been caught before and reported as *S. pallipes*. After the comprehensive work done by Drake (2020), distinguishing between the two species becomes easier. *Syntormon pallipes* is a very eurytopic species found from numerous habitats – on riverbanks, marshes, forests, open and shady sites.

Two species could be distinguished as dominant in the studied area. *Hercostomus nanus* dominants from June to the mid of July. After that, *Sybistroma obscurellum* dominated with active period from the mid of July to October (Fig. 2).

Previously, *H. nanus* was reported from a wooded area with a small pond (called “Basha” near Chirpan) in the Upper Thracian Plain (Kechev, Ivanova, 2015). At this site (altitude 149 m a.s.l.) the active flying period of *H. nanus* is in May or one month earlier. It seems that this species dwells in forest and wooded sites with constant availability of water.

*Sybistroma obscurellum* was reported by Kechev (2007) from the banks of a river in the West Rhodopes, near the Dedovo and Hrabrino Villages, 300 – 900 m above sea level.

*Sybistroma nodicornis* is a more common species than *H. nanus* and *S. obscurellum*. It could be found along the banks of small brooks and wooded areas (Kechev, 2007, 2012, 2014; Kechev, Ivanova, 2015).

*Rhaphium caliginosum*, *Campsicnemus curvipes* and *Sympycnus pulicarius* are eurytopic, very common species in Bulgaria and could be found in a wide range of habitats
Figure 2. Number of specimens of *Hercostomus nanus* and *Sybistroma obscurellus* by months

| Species              | Date          | 08.09.2020 | 02.10.2020 | 12.10.2020 |
|----------------------|---------------|------------|------------|------------|
|                      | Site 1 | Site 2 | Site 1 | Site 2 | Site 1 | Site 2 |
| *Sybistroma obscurellus* | 1      | 1     | 4     | 2     | 4     | 1     |
| *Campsicnemus curvipes* | 1      | 1     |       |       |       |       |
| *Syntormon pseudospicatum* |       |       |       |       | 1     |       |
| *Syntormon pallipes* |       |       |       |       | 1     |       |
| *Argyra leucocephala* |       |       |       |       |       | 1     |
| *Rhaphium appendiculatum* | 2      | 1     |       |       |       |       |
| *Rhaphium caliginosum* | 1      | 1     |       |       |       |       |

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