

# Alderflies (Insecta: Megaloptera: Sialidae) from Serbia and Macedonia, with Notes on their Occurrence in the Neighbouring Balkan Countries

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**Abstract:** Data on the occurrence of four alderfly species from the Balkan Peninsula are provided. Alderflies of Serbia and Macedonia are reviewed. Two species are recorded for the first time from the studied region: *Sialis nigripes* PICTET, 1865 in Serbia, and *Sialis lutaria* (LINNAEUS, 1758) in Macedonia.

**Keywords:** Megaloptera, *Sialis*, alderflies, Macedonia, Serbia, Balkan Peninsula

## Introduction

Megaloptera is an ancient insect order, and among the most primitive of the endopterygote insects (MISOFF *et al.* 2014, LIU *et al.* 2012). The small order of neuropterid insects with approximately 300 species includes alderflies, dobsonflies, fishflies and hellgrammites (ANDERSON 2003, ASPÖCK, ASPÖCK 2005, COVER, RESH 2008, LIU *et al.* 2012, MONSERRAT 2014). It contains two extant families, Sialidae and Corydalidae. Sialidae or alderflies occur in all continents of the world (except Antarctica) with c. 75 valid species (LIU *et al.* 2015). In Europe only the family Sialidae with a single genus, *Sialis* LATREILLE, 1802 occur. Adult alderflies (Fig. 1) are medium-sized, short-lived, soft-bodied, with long slender antennae on broad and flattened head, without ocelli, with five-segmented tarsi. Their mouthparts are adapted for biting (ELLIOTT 1977, 1996, ANDERSON 2003, ASPÖCK, ASPÖCK 2005; LIU *et al.* 2015). Alderflies have two pairs of similar membranous wings which are held like peaked roof over abdomen when at rest. Characteristic is a nerve-like network of veins in the wings, with many accessory veins and numerous costal veinlets giving a ladder-like effect along the anterior edge of the wing (ELLIOTT 1996).

Female alderflies lay their eggs on leaves or branches overhanging the water. Predaceous sialid larvae are aquatic and have seven pairs of jointed abdominal gills and abdomen ends with a long tail. The larvae have a well-sclerotised head with large mandibles armed with teeth and used for biting (ELLIOTT 1996). Pupation occurs on land but always close to the water. Characteristic for Megaloptera is pupa dectica.

VSHIVKOVA (1985) and ASPÖCK *et al.* (2001) listed for Europe and the Caucasus 11 alderfly species, five were described as new (VSHIVKOVA 1985). It was recently shown for one of them, *Sialis gonzalezi* VSHIVKOVA, 1985, that it is a synonym for *S. fuliginosa* PICTET, 1836 (MONSERRAT 2014).

The alderfly fauna of Serbia is poorly known and only sporadic records for two species exist (ĐUKIĆ *et al.* 2010, MOCSÁRY 1899, ŽIVOJINOVIĆ 1950, ŽIVIĆ *et al.* 2001, 2005, 2006). The fauna of the Neuropterida of Macedonia is also insufficiently studied, despite the fact that many papers on the occurrence of two neuropterid orders (Raphidioptera and Neuroptera) in the country exist (for review see DEVETAK *et al.* 2015). Records of the third neurop-



Fig. 1. *Sialis lutaria* (L.), adult. Photo V. Klokočovník

terid order, Megaloptera, for the country did not exist. We present here the findings of the megalopteran insects from Serbia and Macedonia.

## Material and Methods

Adult alderflies were collected using an insect net; the larvae were picked up by hand. Specimens were preserved in 70% ethanol and deposited in the first author's collection. UTM coordinates are provided for each location. For identification we used fundamental literature (for the larvae: KAISER 1977, ELLIOTT 1996; for adults: ASPÖCK *et al.* 1980, ELLIOTT 1996).

## Results

### Megaloptera

#### Sialidae LEACH in BREWSTER, 1815

#### *Sialis* LATREILLE, 1802

##### *Sialis lutaria* (LINNAEUS, 1758)

Literature records: In the Balkan Peninsula the species has been recorded from Bosnia and Herzegovina, Bulgaria, Croatia, Macedonia, Montenegro, Romania, Serbia, and Slovenia (ASPÖCK *et al.* 1980, 2001, DEVETAK 1984, 1991, 1992a, 1992b, ĐUKNIĆ *et al.* 2010, KIS 1959, KIS, STAMP 1964, Klapálek 1899, 1900a,b, 1906, KUMANSKI, POPOV 2000, POPOV 1981, 1998, 2000b, SMILJKOV *et al.* 2005, ZELENÝ 1971, ŽIVOJNOVIĆ 1950; Table 1).

Material examined (Fig. 2):

Serbia:

Vlasinsko jezero: Vučadelce, 42°40'34"N 22°19'14"E, UTM coordinates FN02, 11. VI. 1985 1 f, I. Sivec leg.

Macedonia:

Jablanica Mountain: glacial lake Podgorechko Ezero, 41°15'31"N 20°31'19"E, DL66, 19. X. 2014, 20 larvae, leg. V. Slavevska-Stamenković. The larvae were collected from muddy bottom in the littoral region of the lake.

##### *Sialis fuliginosa* PICTET, 1836

Literature records: In the Balkan Peninsula the species has been recorded from Bosnia and Herzegovina, Bulgaria, Croatia, Montenegro, Romania, Serbia, and Slovenia (ASPÖCK *et al.* 1980, 2001, DEVETAK 1984, 1991, 1992a, 1992b, ĐUKNIĆ *et al.* 2010, JOOST 1973, KIS 1959, KIS, STAMP 1964, Klapálek 1899, 1900a,b, 1906, POPOV 1981, 1998, 2000a, 2000b, ŽIVIĆ *et al.* 2001, 2005, 2006). MOCSÁRY (1899) reports on the occurrence of the species from Grebenac in Vojvodina (Banat), a part of Serbia, that is not a part of the Balkan Peninsula.

Material examined (Fig. 2):

Serbia:

Bor, Luka, 44°05'11"N 22°01'12"E, EP99, 8. V. 1986, 1 f, I. Sivec leg.;

Donji Milanovac, Crnajka, Tanda, 44°16'24"N 22°09'06"E, EP99, 8. V. 1986, 1 f, I. Sivec leg.;

Stara planina: Pirot: Dojkinci, Dojkinačka reka, 43°10'54"N 22°49'51"E, FN48, 14. VI. 1985, 1 f, I. Sivec leg.;

Stara planina: Pirot: Dojkinci, Dojkinačka reka, 43°14'34"N 22°46'42"E, FN58, 13. VI. 1985, 3 f, I. Sivec leg.;

Stara planina: Zaječar-Knjaževac: Selačka, Suvodolski manastir, 43°42'03"N 22°21'08"E, FP03, 8. VI. 1986, 3 f, I. Sivec leg.;



Fig. 2. Distribution of the species of the genus *Sialis* Latreille in Serbia and Macedonia: filled circles – *Sialis fuliginosa*, open circles – *S. nigripes*, squares – *S. lutaria*

**Table 1.** Occurrence of alderflies (Sialidae) in Serbia, Macedonia and the neighbouring Balkan countries

Species / Country	Albania	Bosnia and Hercegovina	Bulgaria	Croatia	Greece	Macedonia	Montenegro	Romania	Serbia	Slovenia
<i>Sialis lutaria</i> (LINNAEUS, 1758)	-	x	x	x	-	x	x	x	x	x
<i>Sialis fuliginosa</i> PICTET, 1836	-	x	x	x	-	x	x	x	x	x
<i>Sialis nigripes</i> PICTET, 1865	-	-	x	x	x	-	-	-	x	x
<i>Sialis morio</i> KLINGSTEDT, 1932	-	-	-	x	-	-	-	x	-	-

Vrnjačka Banja, Stanišinci, 43°31'49"N 20°54'56"E, DP92, 11. V. 1986, 2 m, I. Sivec & B. Horvat leg.;

Vrnjačka Banja, Mitrovo Polje, Željina, 43°27'50"N 20°45'53"E, DP91, 11. V. 1986, 1 m, I. Sivec & B. Horvat leg.;

Macedonia:

Osogovske planine, r. Kamenička reka, 42°06'24"N 22°31'18"E, FM26, 9. VI. 1985, 7 ff, I. Sivec & M. Štangelj leg.

Kochani: 24 km SE: Laki, r. Osojnica, 41°47'54"N 22°40'04"E, FM32, 10. VI. 1985, 1 f, I. Sivec leg.

First records from Macedonia.

### *Sialis nigripes* Pictet, 1865

Literature records: In the Balkan Peninsula the species has been recorded from Bulgaria, Greece, Croatia and Slovenia (ASPÖCK *et al.* 1980, 2001; DEVETAK 1984, 1992a, 1992b, JOHNSON *et al.* 1995, POPOV 1981, 1998).

Material examined (Fig. 2):

Serbia:

Požarevac, Breznica, Petrovac, 44°22'43"N 21°24'51"E, EQ40, 6. V. 1986, 1 m, I. Sivec leg.;

Požarevac, Petrovac, Melnica, 44°24'49"N 21°29'40"E, EQ41, 6. V. 1986, 1 f, I. Sivec leg.

First record from Serbia.

## Discussion

Four alderflies species occur in the Balkan Peninsula (Table 1). An additional species, which has not yet been found from Serbia and Macedonia, is *Sialis morio* KLINGSTEDT, 1932. This rare species is known from the peninsula only from Croatia and Romania (ASPÖCK *et al.* 1980, 2001, DEVETAK 1992a, 1992b; Table 1). The other rare species, *Sialis nigripes* PICTET, 1865, is also expected to be found in Macedonia.

Alderfly larvae occur in various freshwater environments, ranging from well springs and small brooks to large rivers, and from ponds to large lakes. Larvae feed on small invertebrates such as annelids, crustaceans, gastropods and insect larvae. *Sialis* larvae are found both in unpolluted and polluted waters but they prefer unpolluted ones (e.g. GIRGIN *et al.* 2003). *Sialis lutaria* tolerates the alpha-mesosaprobic zone, i.e. water some distance from a pollution source that is poorly oxygenated (SPELLERBERG 2005).

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Received: 13.05.2015  
Accepted: 29.09.2015