

## FAUNA OF EPHEMEROPTERA IN THE RUNNING WATERS OF WEST SERBIA

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**Abstract** – During the period 1988 – 1996 the Ephemeroptera diversity in West Serbia was studied. These investigations included 124 springs, considerable number of spring regions, as well as rivers: the Sušica, Djetinja, Skrapež, Pocibrava, Banja, Gradac, Jablanica, Obnica and Kolubara. A total of 45 taxa belonging to 8 families were identified. At the majority of sampling locations: *Baetis rhodani*, *Baetis* sp., *Ecdyonurus* sp., *Ephemera danica*, *Ephemerella ignita*, *Caenis moesta*, *Habroleptoides modesta* and *Rhitrogena semicolorata* were present. The smallest Ephemeroptera diversity in the studied waters was recorded in springs and the greatest one in middle parts of the mountain running waters.

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### INTRODUCTION

Ephemeroptera are a very old group of insects that appeared in the Younger Paleozoic period. They are among the most important groups of insects. Their larvae inhabit freshwater ecosystems having a significant place in secondary productivity and fish feeding in running waters. Ephemeroptera are very sensitive to the changes of environmental conditions in running waters particularly to organic pollution and therefore represent suitable indicators of water quality. Usually they inhabit rocky and stony bottom, but some of them find their shelter in moss growth (*Habroleptoides*), fallen leaves (*Paraleptophlebia*) or burrow in soft muddy or sandy deposits (*Ephemera*). Morphologically they are adapted to specific environmental conditions of their habitat.

Faunistic and taxonomic studies of Ephemeroptera have started in Europe more than a century ago. In Serbia the first data about Ephemeroptera appeared at the end 19th and the beginning of 20th century when Klapek (1898, 1906), studying Ephemeroptera from Bosnia and Herzegovina, collected two of 26 listed taxa from the river Uvac (at present in Serbia). As far as in 1950, Živojinović (1950) listed 9 species of Ephemeroptera from the rivers of East Serbia. Filipović (1954, 1968, 1969, 1975, 1976, 1979) published the data of her investigations in the running waters of Kopaonik and Zlatibor mountain regions, as well as in the regions of Golija, Kučaj, Rtanj, Crni Vrh and Tupižnica where she investigated this group of insects in the course of biocenological studies of mountain running waters, including Ephemeroptera. Up to now, only two publications were dealing with Ephemeroptera (Marković and Janković 1989; Marković and Mitrović-Tutundžić 1997).

### MATERIAL AND METHODS

The study of Ephemeroptera in running waters of mountain regions in West Serbia was carried out during the period 1988 - 1996. In this study, 124 springs, a considerable number of spring regions and water courses of the Sušica, Djetinja, Skrapež, Banja, Pocibrava, Gradac, Jablanica, Obnica and Kolubara were included.

The samples of Ephemeroptera larvae were collected by hand from waterbeds and using modified Surber net. Identification was done with the preserved material, using determination keys (Žadin 1940; Ikonov 1959; Grandi 1960; Muller-Liebenau 1975; Zelinka 1980).

### RESULTS AND DISCUSSION

During the nine-year-study period of Ephemeroptera from springs, spring regions and mountain running water a total of 45 taxa from 8 families were recorded. The greatest diversity was observed within families Heptagenidae (16 taxa), than Baetidae (11), while Leptophlebiidae (5), Caenidae (4), Ephemerellidae (4), Ephemeridae (3), Siphonuridae (1) and Oligoneuriidae (1) were much less diverse.

Classis **Insecta**

Ordo **Ephemeroptera**

Familia **Heptagenidae**

Genus **Ecdyonurus**

*Ecdyonurus* sp.

Localities: Fountainhead Ladjevac (Rača at Bajina Bašta): 23.8.1994; Spring in the Maljen Mt. (at Čalački stream): 12.8.1993; Spring in the Maljen Mt.

– second: 12.8.1993; Spring at the Gradac river (at Sunčani Vir): 18.8.1994; Spring region of the Pocibrava (Petnica by Valjevo): 19.8.1994; Spring region of the Sušica (Stapari by Užice): 30.5.1994, 23.5.1995; Spring region of Hajdučka Voda (Tara Mt.): from 22.11.1994 to 26.11.1995; Spring region of the Banja (Petnica): 6.3.1994; the Obnica river (Stave by Valjevo): 23.11.1991, 3.8.1992; the Obnica river (Pričevići by Valjevo): 10.5.1991, 23. 11. 1991, 24.5.1992; the Obnica river (Valjevo): 1.8.1991; the Jablanica river (Bebića Luka by Valjevo): 6.8.1992; the Jablanica river (Rovni by Valjevo): 31.10.1992, 6.8.1993, 5.3.1994; the Jablanica river (Valjevo): 10.5. 1991; the Kolubara river (Valjevo): 6.8.1993; the Pocibrava stream (Petnica): from 30.7.1991 to 23.11.1993; the Gradac river (čelije by Valjevo): from 22.5.1993 to 13.11.1993; the Gradac river (Valjevo): from 24.5.1991 to 24.11.1991.

*Ecdyonurus venosus* Fabricius 1775;

Localities: Popovo Vrelo (čelije): from 25.7.1990 to 12.2.1995; Spring region of the Sušica river (Stapari): 2.3.1995., 23.5.1995; the Obnica river (Stave): from 10.5.1991 to 5.3.1994; the Jablanica river (Rovni): 24.5.1992, 12.11.1993.

Distribution in Europe: (according to P u t h z 1978): The Iberian Peninsula, the Pyrenees, Italy, the Alps, Dinaric west Balkans and East Balkans, West and Central middle Mountains, the Carpathians, Hungarian Plain, Pontic Province, West Plain, Baltic Province, East Plain, Ireland and England.

*Ecdyonurus helveticus* Eaton, 1887 (= *E. bollenganus*);

Localities: Spring region of the Ljubišnica river - little fountain head (Ljubiš, Zlatibor Mt.): 4.7.1994.

Distribution in Europe: Italy, the Alps, Greek west Balkans, East Balkans, West middle Mountains, while for the area of West Serbia which belongs to the region of Dinaric west Balkans it was ljuoted (according to P u t h z 1978): that the species *Ecdyonurus helveticus* was not found, but it can be expected with great probability.

*Ecdyonurus dispar* Curtis, 1834 (= *E. fluminium*);

Localities: Fountainhead Ladjevac: 22.11.1994; the Obnica river (Pričevići): 23.11.1991, 5.3.1994; the Obnica river (Valjevo): 1.2.1992; the Kolubara river (Valjevo): 25.5.1992; the Gradac river (Valjevo): 24.5.1992; the Djetinja river (Stapari):

22.8.1988, 10.11.1988; the Djetinja river (Užice): 17.5.1988, 10.11.1988; the Sušica river (Stapari): 10.11.1988.

Distribution in Europe: the Iberian Peninsula, the Pyrenees, Italy, the Alps, the Balkans, West and Central middle Mountains, the Carpathians, Hungarian Plain, Pontic Province, West Plain, East Plain, Ireland and England.

*Ecdyonurus torrentis* Kimmins, 1942;

Localities: Spring in the Maljen Mt. (by Kraljev Stol): 12.8.1993; Spring region of the Hajdučka Voda (Tara Mt.): 1.6.1994, 23.8.1994; the Jablanica river (Bebića Luka): 31.7.1991; the Jablanica river (Rovni): 16.1.1993.

Distribution in Europe: East Balkans, West and Central middle Mountains, the Carpathians, Hungarian Plain, East Plain, Ireland and England. For Dinaric west Balkan neither the presence nor the absence of *Ecdyonurus torrentis* was proved (according to P u t h z 1978).

*Ecdyonurus submontanus* Landa, 1970;

Locality: the Jablanica river (Bebića Luka): 6.8.1992.

Distribution in Europe: Central middle Mountains, the Carpathians and East Plain. For the Balkans (according to P u t h z 1978) neither the presence nor the absence of *Ecdyonurus submontanus* was proved.

*Ecdyonurus ljuadrilineatus* Landa, 1970;

Locality: Spring of Pocibrava: 15.5.1995, 19.8.1995.

Distribution in Europe: Central middle Mountains, the Carpathians, Central and East Plains. For the Balkans neither the presence nor the absence of *Ecdyonurus ljuadrilineata* was proved (according to P u t h z 1978).

*Ecdyonurus affinis* Eaton, 1885;

Localities: Sušica fountainhead: 2.3.1995; Spring of Pocibrava: from 8.8.1993 to 15.5.1995; Spring region of the Pocibrava stream: from 23.5.1993 to 19.8.1995; Spring region of the Banja river: from 23.5.1993 to 18.2.1995; Spring region of Degurića fountainhead: 4.7.1992; the Pocibrava stream: from 11.5.1991 to 8.8.1993.

Distribution in Europe: Greek west Balkans, Central Plains, East Plains, and Baltic Province. For Dinaric west Balkans neither the presence nor the absence of *Ecdyonurus torrentis* was proved (according to P u t h z 1978).

***Ecdyonurus lateralis* Curtis, 1834 (= *E. rivulorum*);**

Localities: Spring of Pocibrava: 17.1.1993; Spring region of the Pocibrava stream: 14.5.1994, 19.8.1995; the Banja river (Bela Stena by Valjevo): 6.3.1994;

Distribution in Europe: the Iberian Peninsula, the Pyrenees, Italy, the Alps, Dinaric west Balkans, East Balkans, West and Central middle Mountains, the Carpathians, Hungarian Plain, Pontic Province, West, Central and East Plains, Baltic Province, Ireland and England.

**Genus *Heptagenia******Heptagenia* sp.**

Localities: Sušica Fountainhead (Stapari): 23.5.1995; Spring of Pocibrava: 8.8.1993, 12.11.1994; Spring region of the Sušica river (Stapari): 22.8.1990, 23.5.1995, 5.8.1995; Spring region of the Pocibrava river: 13.11.1993, 19.8.1995; the Jablanica river (Bebića Luka): 31.1.1992; the Jablanica river (Rovni): 31.1.1992, 24.5.1992, 5.3.1994; the Pocibrava stream (Petnica) 2.8.1992, 8.8.1993.

***Heptagenia sulphurea* Müller, 1776;**

Locality: Spring region of the Gradac river (Bogatić by Valjevo): 14.5.1994, 17.5.1995;

Distribution in Europe: the Iberian Peninsula, Italy, Greek west Balkans, East Balkans, West and Central middle Mountains, the Carpathians, Hungarian Plain, Pontic Province, West and Central Plains, Baltic province, East Plain, Ireland, England, Boreal Plateau, Tundra, Taiga and the Caucasus. While for the area of West Serbia, which belongs to the region of Dinaric west Balkans it was quoted (according to Puthz 1978) that the species *Heptagenia sulphurea* has not been found, but it can be expected with a great probability.

***Heptagenia fuscogrisea* Retzius, 1783 (= *Heptagenia rosicus*);**

Localities: Sušica fountainhead: 23.11.1994, 2.3.1995; Spring in the Maljen Mt. (by Čalački stream): 12.8.1993; Spring region of the Sušica river (Stapari): 2.3.1995.

Distribution in Europe: East Balkans, Central middle Mountains, the Carpathians, Hungarian Plain, West, Central and East Plains, Baltic Province, Ireland, England, Boreal Plateau, Tundra, North Sweden and Taiga. For Dinaric west Balkan neither the presence nor the absence of *Heptagenia fuscogrisea* was proved (according to Puthz 1978).

***Heptagenia coreulans* Rostock, 1877;**

Localities: the Jablanica river (Bebića Luka): 12.11.1993; the Pocibrava stream: 22.5.1993; the Gradac river (Valjevo): 1.2.1992.

Distribution in Europe: Italy, the Alps, East Balkans, West middle Mountains, the Carpathians, Hungarian Plain, Pontic Province, West and Central Plains, Baltic Province, East Plain, Tundra, Taiga. For Dinaric west Balkans the presence of *Heptagenia coreulans* (according to Puthz 1978) was not proved with certainty.

**Genus *Rhitrogena******Rhitrogena semicolorata* Curtis, 1834 (= *Rhitrogena griseoculata*);**

Localities: Spring region of the Ljubišnica river - little fountainhead (Ljubiš, Zlatibor Mt.): 4.7.1994; Spring region of the Gradac river (Bogatić): 16.1.1993; Spring region of Hajdučka Voda (Tara Mt.): from 1.6.1994 to 26.11.1995; Obnica (Stave) 24.5.1992; Jablanica (Bebića Luka): from 11.5.1991 to 5.3.1994; the Jablanica river (Rovni): from 11.5.1991 to 12.11.1993; the Gradac river (čelije): from 11.5.1991 to 5.3.1994; the Djetinja river (Stapari): 15.1.1988, 11.10.1988; the Djetinja river (Užice): 17.5.1988.

Distribution in Europe: the Iberian Peninsula, the Pyrenees, Italy, the Alps, the Balkans, West and Central middle Mountains, the Carpathians, Hungarian Plain, Pontic Province, West Plain, East Plain, Ireland and England.

**Genus *Epeorus******Epeorus* sp.**

Locality: the Djetinja river (Turica by Užice): 16.1.1988, 17.5.1988, 10.11.1988.

***Epeorus assimilis* Eaton, 1885 (= *Epeorus sylvicola*);**

Localities: Spring region of the Gradac river (Bogatić): 22.5.1993, 19.2.1995; the Jablanica river (Bebića Luka): 31.1.1992.

Distribution in Europe: the Iberian Peninsula, the Pyrenees, Italy, the Alps, the Balkans, West and Central middle Mountains, the Carpathians, Hungarian Plain, Pontic Province, West Plain, East Plain and Caucasus.

**Familia *Leptophlebiidae*****Genus *Habroleptoides******Habroleptoides modesta* Hagen, 1864 (= *Habroleptoides carpatica*);**

Localities: Spring of Hajdučka Voda (Tara Mt.): 22.11.1994; Spring in the Maljen Mt. (by Čalački

stream): 12.8.1993; Spring in the Maljen Mt. - second: 12.8.1993; Spring in the Maljen Mt. - third: 12.8.1993; Spring on the Maljen - fourth: 12.8.1993; Spring region of Hajdučka Voda (Tara Mt.): 22.11.1994, the Obnica river (Stave): 24.5.1992, 15.1.1993, 21.5.1993; the Jablanica river (Bebića Luka): 31.1.1992, 5.3.1994; the Jablanica river (Rovni): 31.10.1992, 16.1.1993, 12.11.1993; the Pocibrava stream: 22.5.1993; the Gradac river (Čelije): 13.11.1993, 5.3.1994; the Gradac river (Valjevo): 24.11.1991, 1.2.1992, 24.5.1992; the Djetinja river (Vrutci): from 16.1.1988 to 10.11.1988; the Sušica river (Stapari): 16.1.1988, 10.11.1988; the Djetinja river (Užice): 16.1.1988, 22.8.1988, 10.11.1988;

Distribution in Europe: the Iberian Peninsula, the Pyrenees, Italy, the Alps, the Balkans, West and Central middle Mountains, the Carpathians, Hungarian Plain, Pontic Province.

#### Genus *Paraleptophlebia*

##### *Paraleptophlebia cincta* Retzius, 1783;

Locality: the Jablanica river (Rovni): 5.3.1994.

Distribution in Europe: West and Central middle Mountains, the Carpathians, Hungarian Plain, West and Central Plains, Baltic province, East Plain, Ireland, England, Boreal Plateau, Tundra, Taiga. For the Balkans neither the presence nor the absence of *Paraleptophlebia cincta* was proved (according to Puthz 1978).

##### *Paraleptophlebia submarginata* Stephens, 1835

(= *P. castanea*);

Localities: the Djetinja river (Stapari): 10.11.1988; the Djetinja river (Užice): 16.1.1988.

Distribution in Europe: Found throughout Europe, except in the Iceland, the Caucasus and Caspian Plain.

#### Genus *Habrophlebia*

##### *Habrophlebia lauta* Eaton, 1884;

Localities: Spring Hajdučka Voda (Tara Mt.): 22.11.1994, Spring of Pocibrava: 8.8.1993, Spring on the Maljen Mt. (by Kraljev Stol): 12.8.1993; Spring region of the Sušica river (Zlatibor Mt.): 4.9.1989, 30.5.1994, the Obnica river (Stave): 21.5.1993; the Pocibrava stream: 8.8.1993; the Djetinja river (Uice): 23.8.1988.

Distribution in Europe: Italy, the Alps, the Balkans, West and Central middle Mountains, the Carpathians, Hungarian Plain, West, Central and East Plains, Baltic province, Tundra and Taiga.

##### *Habrophlebia fusca* Curtis, 1834;

Locality: Spring Hajdučka Voda (Tara Mt.): 22.11.1994.

Distribution in Europe: the Iberian Peninsula, the Pyrenees, Italy, the Alps, the Balkans, West and Central middle Mountains, the Carpathians, Hungarian Plain, Pontic Province, West, Central and East Plains, Baltic Province, England and Taiga.

#### Familia *Baetidae*

##### Genus *Baetis*

##### *Baetis* sp.

Localities: Sušica fountainhead (Stapari): 23.11.1994, 2.3.1995, 23.5.1995; Fountainhead Ladjevac: 22.11.1994; Fountainhead Popovo Vrelo: from 25.7.1990 to 19.2.1995; Spring near the Gradac river by Sunčani Vir: 18.8.1995; Degurića fountainhead (Degurići): 4.7.1990, 20.8.1994; Sokanovića fountainhead (Bioska by Užice): 26.11.1995; Little fountainhead of the Rača river (Rača): 26.11.1995; Spring of the Uvac river: 23.10.1995; Fountainhead Veliko Vrelo (Medjani): 29.10.1995; Spring region of the Pocibrava stream: 14.5.1994, 20.2.1995; Spring region of the Sušica river (Stapari): 22.8.1990, 30.5.1994, 28.8.1994; Spring region of the Gradac river: from 25.7.1990 to 14.8.1995; Spring region of Hajdučka Voda: 1.6.1994, 26.11.1995; Spring region of the Povlenska river (Povlen Mt.): 28.8.1994; Spring region of the Raška river: 29.11.1995; the Obnica river (Stave): 24.5.1992, 3.8.1992; the Jablanica river (Bebića Luka): from 31.7.1991 to 5.3.1994; the Jablanica river (Rovni): from 31.7.1991 to 21.5.1993; the Pocibrava stream (Petnica): from 11.5.1991 to 8.8.1993; the Banja river (Bela Stena): from 2.8.1991 to 8.8.1993; the Gradac river (Bogatić): from 12.5.1991 to 13.11.1993; the Gradac river (Čelije): from 11.5.1991 to 5.3.1994; the Gradac river (Valjevo): from 2.8.1991 to 13.11.1993; the Skrapež river (Požega): 17.1.1988; the Djetinja river (Vrutci): 22.8.1988.

##### *Baetis vernus* Curtis, 1834;

Locality: Spring region of the Gradac river (Bogatić): 6.8.1993, 14.5.1994.

Distribution in Europe: the Pyrenees, Italy, the Alps, the Balkans, West and Central middle Mountains, the Carpathians, Hungarian Plain, Pontic Province, West, Central and East Plains, Baltic Province, Ireland, England, Boreal Plateau, Tundra, Taiga and the Caucasus.

*Baetis fuscatus* Linne 1761(=*B. bioculatus*, = *B. venustulus*);

Localities: Spring region of the Gradac river: 14.8.1995; the Kolubara river (Lajkovac): 1.11.1992; the Pocibrava stream (Petnica): 30.7.1991; the Banja river (Bela Stena): 13.11.1993; the Gradac river (Čelije): from 6.8.1992 to 6.8.1993.

Distribution in Europe: the Iberian Peninsula, the Pyrenees, Italy, the Alps, Dinaric west Balkans, East Balkans, West and Central middle Mountains, the Carpathians, Hungarian Plain, Pontic Province, West, Central and East Plains, Baltic Province, England, Boreal Plateau, Tundra, North Sweden, Taiga.

*Baetis alpinus* Pictet 1843 (= *B. carpaticus*, = *B. doriei*);

Localities: Spring region of the Gradac river: 13.11.1993; the Djetinja river (Vrutci): 22.8.1988; Distribution in Europe: the Iberian Peninsula, the Pyrenees, Italy, the Alps, the Balkans, West and Central middle mountains, the Carpathians, Pontic Province, West and East Plains.

*Baetis rhodani* Pictet 1843 (= *B. pusillus*);

Localities: Sušica fountainhead (Stapari): 23.11.1994, 2.3.1995, 28.11.1995; Ladjevac fountainhead: 26.11.1995; Little lower fountainhead of the Gradac river (Bogatić): 14.8.1995; Degurića fountainhead (Degurići): 4.7.1992; Spring region of the Ljubišnica river - little fountainhead (Ljubiš): 4.7.1992; Spring region of Sušica (Stapari): 30.5.1994; Spring region of the Gradac river: from 12.5.1991 to 19.2.1995; Spring region of Ladjevac (Rača): 31.7.1995, Spring region of the Banja river (Petnica) 8.8.1993; Spring region of Pocibrava (Petnica): 8.8.1993; the Obnica river (Stave): 5.3.1994; the Obnica river (Pričevići): 5.3.1994; the Obnica river (Valjevo): from 23.11.1991 to 5.3.1994; the Kolubara river (Valjevo): from 2.8.1991 to 25.5.1992; the Kolubara river (Lajkovac): 5.8.1992; the Jablanica river (Bebića Luka): from 11.5.1991 to 5.3.1994; the Jablanica river (Rovni): from 31.7.1991 to 5.3.1994; Pocibrava stream 10.5.1991, 22.5.1993, 8.8.1993; the Banja river (Bela Stena): from 2.8.1991 to 8.8.1993; the Gradac river (Bogatić): 16.1.1993; the Gradac river (Čelije): from 23.5.1992 to 5.3.1994; the Gradac river (Valjevo): from 2.8.1991 to 5.3.1994; the Sušica river (Stapari): 16.1.1988, 17.5.1988, 10.11.1988; the Djetinja river (Vrutci): 22.8.1988, 10.11.1988; the Djetinja river (Stapari): from 16.1.1988 to 10.11.1988; the Djetinja river (Užice):

from 16.1.1988 to 10.11.1988; the Skrape river (Požega): 17.1.1988, 18.5.1988.

Distribution in Europe: Throughout Europe except the Iceland and Caspian Plain where the presence of the this species was not proved for certain (according to P u t h z 1978).

*Baetis tracheatus* Keffermuller & Machel, 1967;

Locality: Spring region of the Gradac river: 19.2.1995, 17.5.1995;

Distribution in Europe: Central Plain, while for the majority of other regions among them the Balkans (according to P u t h z 1978) either the presence or the absence were not proved.

*Baetis lutheri* Muller - Liebenau, 1967;

Localities: Spring region of the Gradac river: 20.8.1994, 17.5.1995; the Obnica river (Stave): 15.1.1993; the Jablanica river (Bebića Luka): 21.5.1993; the Gradac river (Bogatić): 6.8.1991, 13.11.1993; the Gradac river (Čelije): 23.5.1992; the Djetinja river (Vrutci): 22.8.1988; 10.11.1988; the Sušica river (Stapari): 10.11.1988; the Djetinja river (Užice): 10.11.1988;

Distribution in Europe: the Iberian Peninsula, the Pyrenees, the Alps, Greek west Balkans, East Balkans, West middle Mountains, Central middle Mountains, the Carpathians, Pontic Province, West Plain, East Plain. For the region of the Dinaric west Balkans it was noted (according to P u t h z 1978) that the species *Baetis lutheri* has not been found, but it could be expected with a great probability.

*Baetis buceratus* Eaton, 1870 (= *B. grandii*);

Locality: the Pocibrava stream (Petnica): 11.5.1991.

Distribution in Europe: the Iberian Peninsula, Italy, East Balkans, West middle Mountains, Pontic Province, Central Plain, Eastern Plain and England, while for the area of West Serbia which belongs to the region of Dinaric west Balkans it was ljuoted (according to P u t h z 1978) that the species *Baetis buceratus* was not found, but it can be expected with a great probability.

#### Genus *Centroptilum*

*Centroptilum luteolum* Muller 1776;

Locality: Spring region of Hajdučka Voda (Tara Mt.): 22.11.1994.

Distribution in Europe: Throughout Europe except the regions of the Iceland and Caspian Plain.

**Genus Cloen****Cloen** sp.

Locality: the Obnica river (Valjevo): 10.5.1991.

**Cloen dipterum** Linne, 1761 (= *C. rufulum*, = *C. szegedi*);

Localities: Spring region of the Gradac river: 22.5.1993; Spring (Prljevići at Užice): 22.10.1995.

Distribution in Europe: Throughout Europe except the Iceland, the Pyrenees, Ireland and Caspian Plains.

**Familia Caenidae****Genus Caenis****Caenis** sp.

Localities: the Kolubara river (Valjevo): 23.5.1992, 6.8.1993; the Obnica river (Stave): 24.5.1992, 3.8.1992, 21.5.1993; the Obnica river (Pričevići): from 10.5.1991 to 5.3.1994; the Obnica river (Valjevo): from 1.8.1991 to 5.3.1994; the Kolubara river (Valjevo) from 2.8.1991 to 12.11.1993; the Kolubara river (Lajkovac): 6.8.1993; the Jablanica river (Bebića Luka): 31.7.1991, 6.8.1992; the Jablanica river (Rovni): 11.5.1991, 6.8.1993, 5.3.1994; the Jablanica river (Valjevo): 24.5.1992, 4.8.1992, 21.5.1993; the Banja river (Bela Stena): 13.11.1993; the Gradac river (Valjevo): 2.8.1991, 1.2.1992.

**Caenis macrura** Stephens, 1825;

Locality: the Kolubara river (Lajkovac): 6.8.1993;

Distribution in Europe: Throughout Europe, except in the Iceland where it was not found (according to P u t h z 1978) as well as, in the Iberian Peninsula, Ireland, North Sweden and Caspian Plain where neither the presence nor the absence were proved.

**Caenis undosa** Tiensuu, 1929 (= *C. lactea*);

Localities: the Obnica river (Stave): 3.8.1992; the Kolubara river (Valjevo): 23.5.1992, 6.8.1993; the Gradac river (čelije): 11.5.1991.

Distribution in Europe: the Alps, Central middle Mountains, West, Central and East Plains, Baltic Province, Boreal Plateau, Tundra and Taiga. For the Balkans neither the presence nor the absence of *Caenis undosa* was proved (according to P u t h z 1978).

**Caenis pseudorivolorum** Keffermuller, 1960;

Locality: the Obnica river (Stave): 3.8.1992.

Distribution in Europe: Pontic Province, Central and East Province. For the Balkans neither the presence nor the absence of *Caenis pseudorivolorum* were proved (according to P u t h z 1978).

**Familia Ephemeridae****Genus Ephemera****Ephemera** sp.

Localities: Spring of the Pocibrava stream (Petnica): 15.5.1995; Spring of the Uvac river: 23.10.1995; the Obnica river (Stave): 1.8.1991, 23.11.1991; the Obnica river (Pričevići): 1.8.1991; the Obnica river (Valjevo): 10.5.1991, 1.11.1992; the Jablanica river (Bebića Luka): 6.8.1992; the Jablanica river (Rovni): 5.3.1994; the Pocibrava stream: 31.10.1992.

**Ephemera danica** Muller, 1764;

Localities: Ladjevac fountainhead (Rača): 1.6.1994, 22.11.1994; Little lower Gradac fountainhead (Bogatić): 14.8.1993; Little Popovo fountainhead (čelije): 20.8.1994; One of Gradac springs by Sunčani vir: 18.8.1995; Spring region of the Pocibrava stream (Petnica): from 17.1.1993 to 19.8.1995; Obnica river (Stave): from 10.5.1991 to 21.5.1993; the Obnica river (Pričevići): 24.5.1992; the Jablanica river (Bebića Luka): 5.3.1994; the Jablanica river (Rovni): 31.1.1992, 31.10.1992, 12.11.1993; the Kolubara river (Valjevo): 31.1.1992; the Pocibrava stream (Petnica): from 30.7.1991 to 5.3.1994; the Gradac river (čelije): 5.3.1994; the Gradac river (Valjevo): 1.2.1992; the Djetinja river (Vrutci): 22.8.1988, 10.11.1988; the Djetinja river (Užice): 22.8.1988; the Djetinja river (Stapari): 10.11.1988; the Sušica river (Stapari): 10.11.1988.

Distribution in Europe: Throughout Europe, except the Iceland, Caucasus and Caspian Plains.

**Ephemera lineata** Eaton, 1870;

Localities: the Obnica river (Stave): 1.8.1991; the Kolubara river (Lajkovac): 1.11.1992.

Distribution in Europe: the Iberian Peninsula, the Balkans, West and Central middle Mountains, the Carpathians, Hungarian Province, Pontic Province, West, Central and East Plains, Baltic Province and England.

**Familia Ephemerellidae****Genus Ephemerella****Ephemerella** sp.

Localities: the Obnica river (Stave): 24.5.1992; the Obnica river (Pričevići): 6.8.1993; the Obnica river (Valjevo): 23.11.1991.

*Ephemerella ignita* Poda, 1761.

Localities: Fountainhead of the Gradac river (Bogatić): from 16.1.1993 to 14.8.1995; the Obnica river (Stave): 3.8.1992; the Obnica river (Pričevići): 24.5.1992; the Obnica river (Valjevo): 1.11.1992; the Kolubara river (Valjevo): 4.8.1991, 21.5.1993; the Kolubara river (Lajkovac): 1.11.1992; the Jablanica river (Bebića Luka): 31.7.1991, 21.5.1993, 6.8.1993; the Jablanica river (Rovni): from 24.5.1992 to 12.11.1993; the Jablanica river (Valjevo): 24.5.1992, 21.5.1993; the Pocibrava stream: 22.5.1993; the Gradac river (Čelije): from 11.5.1991 to 6.8.1993; the Gradac river (Valjevo): from 11.5.1991 to 21.5.1993; the Skrape river (Poega): 16.1.1988; the Djetinja river (Vruci): from 17.5.1988 to 10.11.1988; the Djetinja river (Stapari) 17.5.1988, 22.8.1988, 10.11.1988; the Djetinja river (Uice): 17.5.1988, 10.11.1988; the Sušica river (Stapari): 22.8.1988, 10.11.1988;

Distribution in Europe: Throughout Europe except the Iceland, North Sweden and Caspian Plain.

*Ephemerella kreignoffi* Ulmer, 1919 (= *E. mucronata*);

Locality: the Obnica river (Stave by Valjevo): 23.11.1991.

Distribution in Europe: the Balkans, West and Central middle Mountains, the Carpathians, Hungarian Plain, Central and East Plains, Baltic Province, Boreal Pateau, Tundra, North Sweden and Taiga.

*Ephemerella (Torleya) major* Klapalek, 1905 (= *E. belgica*);

Localities: the Obnica river (Stave): 23.11.1991; the Jablanica river (Bebića Luka): from 12.11.1993 to 12.11.1993; the Kolubara river (Valjevo): 31.1.1992; the Gradac river (Valjevo): 2.8.1991, 1.11.1992, 5.3.1994; the Djetinja river (Stapari): 16.1.1988, 17.5.1988; the Djetinja river (Užice): 17.5.1988, 10.11.1988.

Distribution in Europe: Italy, the Balkans, West and Central middle Mountains, the Carpathians, Hungarian Plain, Pontic Province, West Plain and East Plain.

## Familia Siphonuridae

## Genus Siphonurus

*Siphonurus* sp.

Locality: Spring by Aljinovići (Bandučki Spring): 29.10.1995.

## Familia Oligoneuriidae

## Genus Oligoneuriella

*Oligoneuriella rheana* Imhoff, 1852;

Localities: the Jablanica river (Rovni): from 31.7.1991 to 6.8.1993; the Gradac river (Čelije by Valjevo): 9.8.1992;

Distribution in Europe: the Iberian Peninsula, Italy, the Balkans, West and Central middle Mountains, the Carpathians, Hungarian Plain, Pontic Province, West and East Plains and Baltic Province.

Ephemeroptera were found in 22 out of 124 investigated springs and in all water courses included in this study. According to the results obtained it can be concluded that the diversity of Ephemeroptera is low in springs. In a considerable number of them they were not even found. Karstic springs are characterized by a higher presence of Ephemeroptera as compared to springs of different geological composition. Ephemeroptera diversity is increasing with the increase of the distance from springs. The highest diversity of mayflies as well as their percentage ratio in the bottom fauna community was found in the middle water courses. In lower parts, increased pollution caused a decrease in Ephemeroptera diversity and the role this group plays in the bottom fauna composition. This is in accordance with the results of earlier studies on this group of insects in Serbia (Filipović 1976)

At the greatest number of the investigated localities the following species were found: *Baetis rhodani*, *Baetis* sp., *Ecdyonurus* sp., *Ephemerella danica*, *Ephemerella ignita*, *Caenis moesta*, *Habroleptoides modesta* and *Rhitrogena semicolorata*.

According to the Limnofauna of Europe (Illies (ed.) 1978) for nine of the taxa identified in the investigated waters, it had been stated that neither their presence or absence was proved in the area of Dinaric west Balkans to which West Serbia belongs. For four taxa it has been stated that they were not found, but they could be expected with a great probability, while the presence of *Heptagenia coreulans* was not proved with certainty.

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## ФАУНА ТЕКУЋИХ ВОДА ЗАПАДНЕ СРБИЈЕ

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У периоду 1988 - 1996. обављена су фаунистичка истраживања Ephemeroptera у текућим водама брдско-планинских подручја западне Србије. Истраживања су обављена на 124 извора, великом број изворишта, као и на текућима: Сушица, Бетиња, Скрапеж, Поцибрава, Бања, Градац, Јабланица, Обница и Колубара. Забележена су 45 таксона из 8 фамилија инсекатског реда Ephemeroptera. Од констатованих, за 9 врста се у Лимнофауни Европе (Иллиес (ед) 1978) наводи да није потврђено њихово присуство, али ни одсуство у зоогеографској области Динарског западног Балкана коме припада западна Србија, за 4 врсте се констатује

да нису забележене, али да се са великом сигурношћу могу очекивати, док се за врсту *Heptagenia coreulans* наводи да није са сигурношћу доказано њено присуство у овој зоогеографској области. На највећем броју истраживаних локалитета се срећу: *Baetis rhodani*, *Baetis* sp., *Ecdyonurus* sp., *Ephemerella danica*, *Ephemerella ignita*, *Caenis moesta*, *Habroleptoides modesta* и *Rhitrogena semicolorata*. Појединачно по истраживаним текућима најмањи диверзитет је на изворима, јер већи у изворинтима, највећи у средњим деловима тока брдско-планинских текућих вода да би у доњим токовима доспело загађење условило поповно смањење разноврсности Ephemeroptera.