

STONEFLIES (INSECTA: PLECOPTERA) IN THE SHARR MOUNTAINS IN THE REPUBLIC OF NORTH MACEDONIA

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Abstract

Collecting of stonefly species in the area of Shar Mountains National Park (Republic of North Macedonia) was done on 14 localities in 5 visits from June 2023 to October 2024. 43 species was recorded. Winter and early spring collecting were missing, therefore it is not possible to compare with 57 species of stoneflies found in the territory of Shar Mountains in the past. All data of recorded species are presented.

Keywords: Plecoptera, Sharr Mountains, faunistics, checklist

Introduction

Despite of extensive collecting activity of Peter Ikonomov during the sixties to eighties of the last century, the Plecoptera fauna on North Macedonia is relatively well known comparing to the other regions in the area. He summarized 93 species to occur in the country. This number was recently 102 species Rušiti-Dauti (2024). Entomologist from Slovenian Museum of Natural History had been collecting stoneflies also in Macedonia in the last 50 years and resulting with nearly 1000 records of stoneflies in the museum collection of invertebrates. From all of them only 46 records are from the territory of Shar Mountains. Concerning Shar Mountains, Ikonomov (1980) described two new species, *Isoperla breviptera*, Ikonomov 1980 and *Taeniopteryx fusca*, Ikonomov 1980 from Popova Šapka and Tserepashina, respectively. Some new and additional data were added in the recent years what makes stonefly diversity of Shar Mountains with 57 species (Rušiti-Dauti, 2024). Shar Mountains are very large area difficult to access, especially in winter and early spring times. Also collecting in the past are lacking this early time of the year, therefore without doubt there are several early species lacking in the present list. There are a lot of discussions about impact of climate changes to biodiversity. The goal of our study was to contribute to the knowledge of diversity and distribution of stoneflies and possible influence on their fauna to the recent days. We found 43 species of stoneflies, but due to restricted collecting we can not seriously estimate our results of diversity to the old data. At least intense collecting in winter and early spring will be needed for the more reliable comparison of diversity and abundance of stonefly species. We were probably not enough active also in the forest areas, where stoneflies have a specific fauna. It is definitely the Balkan fauna is not exactly the same as Central European, so several species are slightly different and further investigation should confirm their taxonomical identity. In this respect additional genetical investigation like barcoding of stonefly species will bring new data and help to solve several taxonomical problems (Rušiti-Dauti, 2024).

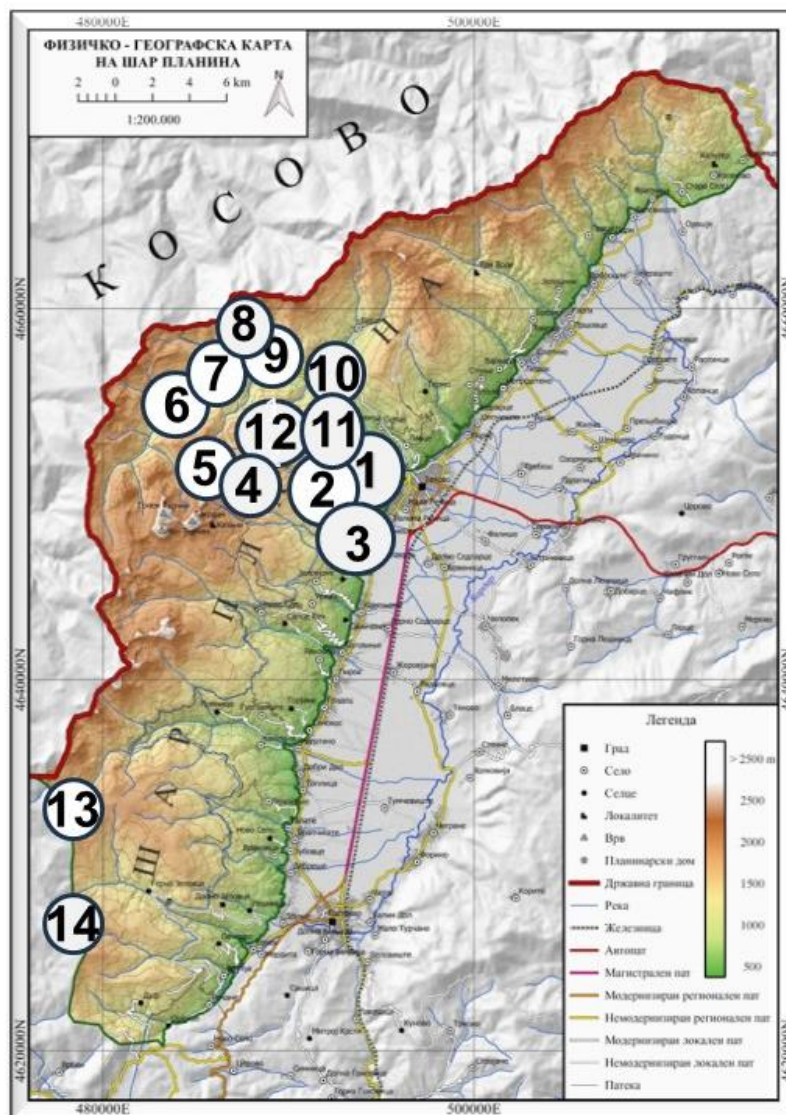
Material and method

Adult stonefly specimens were collected hand picking or using entomological net or beating sheet. Material was conserved in 75 or 96% ethanol and deposited at Department of invertebrates in Stonefly Collection of the Slovenian Museum of Natural History. Some specimens of each species were deposited also in Institute of Ecology and Technology, Popova Šapka as a voucher specimens of this aquatic insects group.

All species when possible were photographed with Cannon EOSD5 MarkII camera with 100 mm macro lens.

Area of investigation

Shar Mountain is the second-highest mountain range in R. North Macedonia, standing at 2747 m and it is situated in the northwest part of the country along the border with Kosovo, the mountain range covers an area of 1670 km² with nearly half (840 km²) belonging to North Macedonia, additionally, it has a length of 80 km (Rušiti-Dauti, 2024). We were collecting in 14 localities in 5 trips (5.6.-11.6.2023; 8.9.-13.9.2023; 20.11.-24.11.2023; 5.5.-12.5.2024 and 7.10.-14.10.2024).



Localities of collecting:

1. Popova Šapka, 1700-1900m
2. Uliverica, 1771m
3. Lisec, 1219m
4. Road to Lešnica1, 2004m
5. Road to Lešnica2, 1846m
6. Dolna Lešnica, 1453m,
7. Bozovce, 1239m,
8. Baba Sanica, 1300m,
9. Veshala, 1220m
10. Brodec, 1032m
11. Jelak, 1926m
12. Crni Kamen, 1769
13. Lukovo Pole, 1200m
14. Ničpur, r. Radika, 980m

Results

We found 43 species of stoneflies. Some of them are with ? either because of inadequate material or need further investigation to confirm their taxonomical identity. Legit for all records are Sivec, Krpač, Kučinić.

List of species:

- 1 *Chloroperla* cf. *brachyptera* Schoenemund 1926
- 2 *Chloroperla kisi* Zwick, 1967
- 3 *Siphonoperla graeca* (Aubert, 1956)
- 4 *Siphonoperla neglecta* (Rostock, 1881)
- 5 *Leuctra bronislawi* Sowa, 1970
- 6 *Leuctra cingulata* Kempny, 1899
- 7 *Leuctra fusca* (Linnaeus, 1758)
- 8 *Leuctra hippopus* Kempny, 1899
- 9 *Leuctra hirsuta* Bogoesco & Tabacaru, 1960
- 10 *Leuctra inermis* Kempny, 1899
- 11 *Leuctra* cf. *metsovonica* Kempny, 1899
- 12 *Leuctra major* Brinck, 1949
- 13 *Leuctra mortoni* cf. *feheri*, Murányi, 1899
- 14 *Leuctra prima* Kempny, 1899
- 15 *Leuctra* cf. *pseudosignifera* Aubert, 1954
- 16 *Leuctra* cf. *rosinae* Kempny, 1900
- 17 *Amphinemura arcadia* Aubert, 1956
- 18 *Amphinemura triangularis* (Ris, 1902)
- 19 *Nemoura asceta* Murányi, 2007
- 20 *Nemoura cinerea* (Retzius, 1783)
- 21 *Nemoura longicauda* Kis, 1964
- 22 *Nemoura marginata* Pictet, 1836
- 23 *Nemoura uncinata* Despax, 1934
- 24 *Nemoura peristeri* Aubert, 1963
- 25 *Nemoura vinconi* Murányi, 2007

- 26 *Nemurella pictetii* (Klapálek, 1900)
- 27 *Protonemura aestiva* Kis, 1965
- 28 *Protonemura autumnalis* Raušer, 1956
- 29 *Protonemura hrabei* Raušer, 1956
- 30 *Protonemura intricata* (Ris, 1902)
- 31 *Protonemura illiesi* Kis, 1963
- 32 *Protonemura* cf. *montana* Kimmins, 1941
- 33 *Protonemura* cf. *nimborella* Mosely, 1930
- 34 *Dinocras megacephala* (Klapálek, 1907)
- 35 *Perla pallida* Guérin- Méneville, 1843
- 36 *Perla* sp1. + sp2. (?sp.n.)
- 37 *Besdolus illyricus* Kovács et Zwick, 2008
- 38 *Isoperla citrina* Murányi, 2011
- 39 *Isoperla tripartita* Illies, 1954
- 40 *Perlodes intricatus* (Pictet 1841)
- 41 *Perlodes microcephalus* (Pictet 1833)
- 42 *Brachyptera beali beali* (Navás, 1924)
- 43 *Brachyptera seticornis* (Klapálek, 1902)

Family: Chloroperlidae, Okamoto, 1912

***Chloroperla* cf. *brachyptera* Schoenemund 1926**

Material examined: NORTH MACEDONIA, Shar Planina: Bozovce. 11.5.2024. 1♂;

***Chloroperla kisi* Zwick, 1967**

Material examined: NORTH MACEDONIA, Shar Planina: Uliverica. 11.6.2023. 1♀; Road to Lešnica1. 10.9.2023. 4♂, 1♀; Road to Lešnica2. 10.9.2023. 1♂, 3♀; Popova Šapka. 8.9.2023. 7♂, 8♀. 13.9.2023. 1♀; Jelak. 12.9.2023. 2♂, 10♀;



***Siphonoperla graeca* (Aubert, 1956)**

Material examined: NORTH MACEDONIA: Shar Planina, Baba Sanica. 9.6.2023. 3♂, 3♀; Popova Šapka. 6.6.2023. 7♂, 5♀. 10.6.2023. 1♂; Uliverica. 7.6.2023. 4♂, 3♀; Lukovo Pole, 8.6.2023. 1♀; Mala Lešnica. 9.6.2023. 4♀;

***Siphonoperla neglecta* (Rostock, 1881)**

Material examined: NORTH MACEDONIA, Shar Planina: Veshala. 11.5.2024. 1♂;



Family: Leuctridae, Klapálek, 1912

***Leuctra bronislawi* Sowa, 1970**

Material examined: NORTH MACEDONIA, Shar Planina: Bozovce. 10.9.2023. 3♀; Veshala. 10.9.2023. 1♂, 1♀. 21.11.2023. 2♀; Mala Lešnica. 10.9.2023. 13♂, 15♀; 21.11.2023. 1♀; Uliverica. 24.11.2023. 1♀;



***Leuctra cingulata* Kempny, 1899**

Material examined: NORTH MACEDONIA, Shar Planina: Crni Kamen. 12.9.2023. 2♂; Jelak. 12.9.2023. 2♀;



***Leuctra fusca* (Linnaeus, 1758)**

Material examined: NORTH MACEDONIA, Shar Planina: Bozovce. 21.11.2023. 1♂;

***Leuctra hippopus* Kempny, 1899**

Material examined: NORTH MACEDONIA, Shar Planina: Baba Sanica. 9.6.2023 1♂; Lisec. 7.6.2023. 1♂; Lukovo Pole. 8.6.2023. 1♂, 5♀; Mala Lešnica. 9.6.2023. 1♀; Uliverica. 11.6.2023. 1♀;



***Leuctra hirsuta* Bogoesco & Tabacaru, 1960**

Material examined: NORTH MACEDONIA, Shar Planina: Brodec. 10.9.2023. 5♂, 5♀. 14.10.2024. 3♂, 5♀; Uliverica. 9.9.2023. 2♂. 23.11.2023. 11♂, 8♀. 24.11.2023. 14♂, 10♀. 12.10.2024. 51♂, 52♀; Veshala. 10.9.2023. 1♂. 21.11.2023. 1♂, 1♀. 14.10.2024. 1♂, 2♀; Bozovce. 21.11.2023. 1♀; Popova Šapka. 20.11.2023. 1♀;



***Leuctra inermis* Kempny, 1899**

Material examined: NORTH MACEDONIA, Shar Planina: Baba Sanica. 9.6.2023. 1♀; Lisec. 7.6.2023. 2♀; Uliverica. 7.6.2023. 1♀; Mala Lešnica. 9.6.2023. 5♀; Popova Šapka. 7.6.2023. 1♂, 1♀. 5.5.2024. 9♂, 19♀; Bozovce. 11.5.2024. 2♀;



***Leuctra cf. metsovonica* Kempny, 1899**

Material examined: NORTH MACEDONIA, Shar Planina: Baba Sanica. 9.6.2023. 2♀; Popova Šapka. 6.6.2023. 1♀. 7.6.2023. 2♂, 51♀. 10.6.2023. 5♀. 8.9.2023. 1♂, 2♀. 5.5.2024. 1♀; Mala Lešnica. 9.6.2023. 1♀; Veshala. 9.6.2023. 1♀. 11.5.2024. 2♂, 7♀; Uliverica. 9.9.2023. 3♂, 12♀. 7.5.2024. 1♂, 1♀; Road to Lešnica2. 10.9.2023. 5♂, 9♀; Crni Kamen. 12.9.2023. 1♀;



***Leuctra major* Brinck, 1949**

Material examined: NORTH MACEDONIA, Shar Planina: Lukovo Pole. 11.9.2023. 1♂; Mala Lešnica. 10.9.2023. 16♂, 13♀; Veshala. 21.11.2023. 1♂, 1♀;



***Leuctra mortoni* cf. *feheri*, Murányi, 1899**

Material examined: NORTH MACEDONIA, Shar Planina: Bozovce. 10.9.2023. 1♂; Brodec. 10.9.2023. 5♂, 5♀; Road to Lešnica1. 10.9.2023. 3♂, 7♀; Veshala. 10.9.2023. 1♂, 1♀; Road to Lešnica2. 10.9.2023. 3♂, 11♀; Popova Šapka. 8.9.2023. 9♂, 3♀. 13.9.2023. 3♂, 7♀. 7.10.2024. 19♂, 16♀. 11.10.2024. 1♂, 1♀; Jelak. 12.9.2023. 5♂, 5♀; Mala Lešnica. 10.9.2023. 2♂, 6♀; Uliverica. 12.10.2024. 1♀;



***Leuctra prima* Kempny, 1899**

Material examined: NORTH MACEDONIA, Shar Planina: Popova Šapka. 6.6.2023. 3♀. 5.5.2024. 1♀; Uliverica. 5.5.2024. 2♀. 7.5.2024. 1♀;



***Leuctra cf. pseudosignifera* Aubert, 1954**

Material examined: NORTH MACEDONIA, Shar Planina: Popova Šapka. 5.5.2024. 8♂, 7♀;
Bozovce. 11.5.2024. 22♂, 16♀; Uliverica. 7.5.2024. 3♂, 6♀;



***Leuctra cf. rosinae* Kempny, 1900**

Material examined: NORTH MACEDONIA, Shar Planina: Popova Šapka. 5.5.2024. 1♂;

Family: Nemouridae Billberg, 1820

***Amphinemura arcadia* Aubert, 1956**

Material examined: NORTH MACEDONIA, Shar Planina: Brodec. 9.6.2023. 1♀; Baba Sanica. 9.6.2023. 5♀;

***Amphinemura triangularis* (Ris, 1902)**

Material examined: NORTH MACEDONIA, Shar Planina: Lisec. 7.6.2023. 1♂, 5♀; Lukovo Pole. 8.6.2023. 2♀; Uliverica. 7.6.2023. 1♂; Popova Šapka. 7.6.2023. 3♂. 5.5.2024. 9♂, 6♀; Baba Sanica. 9.6.2023. 3♂, 12♀; Veshala. 9.6.2023. 1♀. 11.5.2024. 7♂, 2♀; Brodec. 11.5.2024. 2♂;



***Nemoura asceta* Murányi, 2007**

Material examined: NORTH MACEDONIA, Shar Planina: Lisec. 7.6.2023. 1♂, 1♀; Uliverica. 7.6.2023. 2♂, 2♀. 7.5.2024. 1♂, 1♀; Popova Šapka. 7.6.2023. 2♂. 5.5.2024. 11♂, 11♀; Baba Sanica. 9.6.2023. 1♂, 1♀;



***Nemoura cinerea* (Retzius, 1783)**

Material examined: NORTH MACEDONIA, Shar Planina: Popova Šapka. 6.6.2023. 2♂, 9♀. 7.6.2023. 4♂. 8.9.2023. 1♀. 13.9.2023. 2♀. 5.5.2024. 11♂, 10♀; Lisec. 7.6.2023. 1♂; Lukovo Pole. 8.6.2023. 19♂, 10♀; Uliverica. 7.6.2023. 2♀. 7.6.2023. 3♂, 4♀; Baba Sanica. 9.6.2023. 2♀; Mala Lešnica. 9.6.2023. 1♂; Crni Kamen. 12.9.2023. 1♀; Bozovce. 11.5.2024. 1♀; Brodec. 11.5.2024. 2♂;



***Nemoura longicauda* Kis, 1964**

Material examined: NORTH MACEDONIA, Shar Planina: Popova Šapka. 6.6.2023. 1♂.
8.9.2023. 2♂, 9♀. 13.9.2023. 1♀; Jelak. 12.9.2023. 1♀;



***Nemoura marginata* Pictet, 1836**

Material examined: NORTH MACEDONIA, Shar Planina: Bozovce. 11.5.2024. 3♂; Popova Šapka. 5.5.2024. 1♂;



***Nemoura peristeri* Aubert, 1963**

Material examined: NORTH MACEDONIA, Shar Planina: Bozovce. 11.5.2024. 3♂,3♀; Popova Šapka. 5.5.2024. 8♂, 3♀;



Nemoura uncinata Despax, 1934

Material examined: NORTH MACEDONIA, Shar Planina: Popova Šapka. 5.5.2024. 1♂;



***Nemoura vinconi* Murányi, 2007**

Material examined: NORTH MACEDONIA, Shar Planina: Bozovce. 11.5.2024. 2♂,3♀;



***Nemurella pictetii* (Klapálek, 1900)**

Material examined: NORTH MACEDONIA, Shar Planina: Uliverica. 7.6.2023. 6♂, 3♀.
11.6.2023. 1♂ ; Baba Sanica. 9.6.2023. 1♂, 2♀;



***Protonemura aestiva* Kis, 1965**

Material examined: NORTH MACEDONIA, Shar Planina: Bozovce. 11.5.2024. 2♂, 1♀;
Veshala. 11.5.2024. 2♂;

***Protonemura autumnalis* Raušer, 1956**

Material examined: NORTH MACEDONIA, Shar Planina: Mala Lešnica. 10.9.2023. 1♂;
Brodec. 14.10.2024. 1♂; Veshala. 14.10.2024. 1♀; Uliverica. 12.10.2024. 1♂;



***Protonemura hrabei* Raušer, 1956**

Material examined: NORTH MACEDONIA, Shar Planina: Popova Šapka. 20.11.2023. 1♂, 7♀. 7.10.2024. 4♂, 1♀; Veshala. 21.11.2023. 1♀. 14.10.2024. 1♀; Uliverica. 23.11.2023. 4♂, 5♀. 24.11. 2023. 6♂, 25♀. 12.10.2024. 6♂, 3♀; Brodec. 21.2.2023. 1♂, 1♀;



***Protonemura intricata* (Ris, 1902)**

Material examined: NORTH MACEDONIA, Shar Planina: Brodec. 9.6.2023. 2♂,2♀.
11.5.2024. 9♂,1♀, 8 larvae; Mala Lešnica. 9.6.2023. 6♂, 1♀; Popova Šapka. 7.6.2023. 1♀;
Veshala. 11.5.2024. 2♂; Uliverica. 7.5.2024. 1♀;



***Protonemura illiesi* Kis, 1963**

Material examined: NORTH MACEDONIA, Shar Planina: Crni Kamen, 12.9.2023. 1♂;

***Protonemura* cf. *montana* Kimmins, 1941**

Material examined: NORTH MACEDONIA, Shar Planina: Crni Kamen, 12.9.2023. 1♂; Jelak. 12.9.2023. 1♀;



***Protonemura cf. nimborella* Mosely, 1930**

Material examined: NORTH MACEDONIA, Shar Planina: Crni Kamen, 12.9.2023. 1♂;

Family: Perlidae Latreille, 1802

***Dinocras megacephala* (Klapálek, 1907)**

Material examined: NORTH MACEDONIA, Shar Planina: Lukovo Pole. 11.9.2023. 6 exuvia;



***Perla pallida* Guérin- Méneville, 1843**

Material examined: NORTH MACEDONIA, Shar Planina: Baba Sanica. 9.6.2023. 2♂, 1♀;
Veshala. 9.6.2023. 2♂; Ničpur, r. Radika. 8.6.2023. 1♀; Popova Šapka. 21.6.2024. 1♀;



Perla sp1. + sp2. (?sp.n.)

Material examined: NORTH MACEDONIA, Shar Planina: Uliverica. 11.6.2023. 1♂, 1♀; Crni Kamen, 12.9.2023. 3 larvae; Road to Lešnica. 10.9.2023. 1 larva; Lukovo Pole. 11.9.2023. 11 exuvia, 1 larva; Mala Lešnica. 10.9.2023. 1 larva;
Despite being the largest European stonefly species, their taxonomical identity is far from clear. Balkan, Turkey and Iran as the most eastern border of *Perla* distribution need a complete revision of this genus. We are looking for genetic studies to clear the species identity. There are definitely 3 different species in the area of Shar Mountains.



Family: Perlodidae Klapálek, 1909

***Besdolus illyricus* Kovács et Zwick, 2008**

Material examined: NORTH MACEDONIA, Shar Planina: Mala Lešnica. 9.6.2023. 1♀; Popova Šapka. 10.6.2023. 1 exuvium; Veshala. 21.11.2023. 1 exuvium. 11.5.2024. 1♀, 6 exuvia; Bozovce. 11.5.2024. 1♀, 1 exuvium.



***Isoperla citrina* Murányi, 2011**

Material examined: NORTH MACEDONIA, Shar Planina: Lukovo Pole, 8.6.2023. 1♂;
Uliverica. 7.6.2023. 7♂, 2♀. 11.6.2023. 2♂; Popova Šapka. 6.6.2023. 2♂. 7.6.2023. 1♂.
8.9.2023. 4♂, 2♀. 13.9.2023 1♂; Baba Sanica. 9.6.2023. 17♂, 18♀;



***Isoperla tripartita* Illies, 1954**

Material examined: NORTH MACEDONIA, Shar Planina: Baba Sanica. 9.6.2023. 4♂, 1♀;
Popova Šapka. 6.6.2023. 1♂, 1♀. 7.6.2023. 2♂. 13.9.2023. 2♂, 1♀; Uliverica. 7.6.2023. 1♀.
11.6.2023. 1♂, 3♀; Lukovo Pole, 8.6.2023. 3♂, 3♀; Mala Lešnica. 9.6.2023. 6♂; Veshala.
11.5.2024. 1♂, 1♀;



***Perlodes intricatus* (Pictet 1841)**

Material examined: NORTH MACEDONIA, Shar Planina: Uliverica. 11.6.2023. 1♀; Popova Šapka. 6.6.2023. 1♂, 1♀. 10.6.2023. 3♀;

***Perlodes microcephalus* (Pictet 1833)**

Material examined: NORTH MACEDONIA, Shar Planina: Popova Šapka. 7.6.2023. 1♂; Mala Lešnica. 9.6.2023. 1♀;

Family: Taeniopterygidae Klapálek, 1905

***Brachyptera beali beali* (Navás, 1924)**

Material examined: NORTH MACEDONIA, Shar Planina: Popova Šapka. 7.6.2023. 1♀. 10.6.2023. 1♂; Mala Lešnica. 9.6.2023. 1♀; Lukovo Pole. 8.6.2023. 1♀;

***Brachyptera seticornis* (Klapálek, 1902)**

Material examined: NORTH MACEDONIA, Shar Planina: Baba Sanica. 9.6.2023. 1♂, 3♀; Brodec. 9.6.2023. 1♂, 1♀. 11.5.2024. 1♀; Popova Šapka. 6.6.2023. 1♂. 5.5.2024. 1♂, 1♀; Lukovo Pole. 8.6.2023. 2♀; Mala Lešnica. 9.6.2023. 2♀; Veshala, 11.5.2024. 2♂, 4♀, 5 exuvia.



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Legend for figures:

- Fig. 1: *Amphinemura triangularis* (Ris, 1902)
Fig. 2: *Besdolus illyricus* Kovács et Zwick, 2008
Fig. 3: *Besdolus illyricus* 1 Kovács et Zwick, 2008
Fig. 4: *Brachyptera seticornis* (Klapálek, 1902)
Fig. 5: *Chloroperla kisi* Zwick, 1967
Fig. 6: *Dinocras megacephala* (Klapálek, 1907)
Fig. 7: *Isoperla citrina* Murányi, 2011
Fig. 8: *Isoperla tripartita* Illies, 1954
Fig. 9: *Leuctra hippopus* Kempny, 1899
Fig. 10: *Leuctra bronislawi* Sowa, 1970
Fig. 11: *Leuctra* cf. *metsovonica* Kempny, 1899
Fig. 12: *Leuctra* cf. *pseudosignifera* Aubert, 1954
Fig. 13: *Leuctra cingulata* Kempny, 1899
Fig. 14: *Leuctra hirsuta* Bogoesco & Tabacaru, 1960
Fig. 15: *Leuctra inermis* Kempny, 1899
Fig. 16: *Leuctra mortoni* cf. *feheri*, Murányi, 1899
Fig. 17: *Leuctra major* Brinck, 1949
Fig. 18: *Leuctra prima* Kempny, 1899
Fig. 19: *Nemoura marginata* Pictet, 1836
Fig. 20: *Nemurella pictetii* (Klapálek, 1900)
Fig. 21: *Nemoura asceta* Murányi, 2007
Fig. 22: *Nemoura cinerea* (Retzius, 1783)
Fig. 23: *Nemoura longicauda* Kis, 1964
Fig. 24: *Nemoura peristeri* Aubert, 1963
Fig. 25: *Nemoura uncinata* Despax, 1934
Fig. 26: *Nemoura vinconi* Murányi, 2007
Fig. 27: *Perla pallida* Guérin- Méneville, 1843
Fig. 28: *Perla* sp1. + sp2. (?sp.n.)
Fig. 29: *Perla* sp1. + sp2. (?sp.n.)
Fig. 30: *Perlodes* sp.
Fig. 31: *Protonemura autumnalis* Raušer, 1956
Fig. 32: *Protonemura* cf. *montana* Kimmins, 1941
Fig. 33: *Protonemura hrabei* Raušer, 1956
Fig. 34: *Protonemura intricata* (Ris, 1902)
Fig. 35: *Siphonoperla neglecta* (Rostock, 1881)