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Stoneflies (Plecoptera, Insecta) from Vrachanska Planina Mountains

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Abstract. This work summarizes both literature and new data on the fauna of Plecoptera (Insecta) of the Vrachanska Planina Mountains, Bulgaria. A total of 20 species and seven subspecies are known from the mountain. The recorded stoneflies belong to 12 genera and seven families. They represent 25% of the 108 stoneflies currently known from Bulgaria. Among the 27 species that have been recorded, two are Critically Endangered (CR), one –Endangered (EN) and ten – Vulnerable (VU). From a zoogeographical point of view, one subspecies and four species from the Plecoptera, recorded in Vrachanska Planina Mts., are Balkan endemics: *Capnopsis schilleri balcanica* Zwick, 1984, *Leuctra balcanica* Rauser, 1965, *Leuctra hirsuta* Bogoescu, Tabacaru, 1960, *Nemoura braaschi* Joost, 1970 and *Isoperla belai* Illies, 1963. Four of the recorded species are rare for Bulgaria.

Key words: Plecoptera, conservation status, faunistic diversity, Bulgaria.

Introduction

The first data on the stoneflies of the Vrachanska Planina Mts. (Western Stara Planina Mts.) were reported by Braasch & Joost (1971a, b). Later Gueorguiev *et al.* (1998) presented data on the endemic and rare stonefly species in their contribution studying the biological diversity of Insects of Bulgaria. Hubenov *et al.* (2000) summarised all known data for one of the biggest National parks in the country – Central Balkan. More recently Tyufekchieva *et al.* (2013) reported faunistic and ecological information on some species from Bulgaria. The aim of this study is to summarise all data concerning faunistic diversity of the stonefly species in the Vrachanska Planina Mts., Bulgaria, and to present information on their distribution and IUCN Red List categories at a regional level.

Material and Methods

The current review of Plecoptera species in the Vrachanska Planina Mts. based on the available literature and new data. Published records are presented according to literature sources and UTM code numbers. New data of individual records are listed in details: code number, name of watercourse, GPS coordinates, altitude, day, month and year. All their geographic coordinates are provided by Bulgarian UTM Directory computer programme (Michev, 1999). The stoneflies are currently available at the Institute of Biodiversity and Ecosystem Research, BAS (IBER-BAS, Sofia).

The checklist comprises the following data: valid taxa name, published and new records, notes. The used nomenclature and systematics are after Muranyi (2008).

The taxa (species and subspecies) are classified based on the global categories and criteria of IUCN, Version 2014.3 (IUCN, 2014).

Results

Records of Plecoptera species

Order Plecoptera

Family Taeniopterygidae Klapalek, 1905

Genus *Rhabdiopteryx* Klapalek, 1902

***Rhabdiopteryx neglecta neglecta* (Albarda, 1889)**

Localities: FN88: Botunya River, 550 m a.s.l. (Braasch & Joost, 1971a: 269; Gueorguiev *et al.* 1998: 174; Tyufekchieva *et al.* 2013: 95).

Family Capniidae Klapálek, 1905

Genus *Capnia* Pictet, 1841

***Capnia bifrons* (Newman, 1839)**

Localities: GN08: Leva River, tributary of the Botunya River, 500 m a.s.l. (Braasch & Joost, 1971b: 63).

Genus *Capnopsis* Morton, 1896

***Capnopsis schilleri balcanica* Zwick, 1984**

Localities: GN08: Leva River, tributary of the Botunya River, 950 m a.s.l. (Braasch & Joost, 1971a: 279).

Note: From a zoogeographical point of view *C. schilleri balcanica* is Balkan endemic.

Family Leuctridae Klapalek, 1905

Genus *Leuctra* Stephens, 1835

***Leuctra balcanica* Rauser, 1965**

Localities: FN98: Gluharska River, tributary of the Botunya River, 500 – 1000 m a.s.l. (Braasch & Joost, 1971a: 276).

Note: *L. balcanica* is rare and Balkan endemic species.

***Leuctra hippopus* Kempny, 1899**

Localities: FN98: Gluharska River, tributary of the Botunya River, 500 – 1000 m a.s.l. (Braasch & Joost, 1971a: 276); GN08: Leva River, tributary of the Botunya River, 500 m a.s.l. (Braasch & Joost, 1971b: 62).

***Leuctra hirsuta* Bogoescu, Tabacaru, 1960**

Localities: FN98: Gluharska River, N 43^0 10' 27.0" and E 23^0 27' 15.3", 608 m a.s.l., 12.06.2013.

Note: From a zoogeographical point of view *L. hirsuta* is Balkan endemic. This is first record for the Vrachanska Planina Mountain.

***Leuctra inermis* Kempny, 1899**

Localities: FN98: Gluharska River, tributary of the Botunya River, 500 – 1000 m a.s.l. (Braasch & Joost, 1971a: 276).

***Leuctra pseudosignifera* Aubert, 1954**

Localities: GN08: springs of the Botunya River, near Vratsa (Braasch & Joost, 1971b: 62).

Family Nemouridae Newman, 1853

Genus *Amphinemura* Ris, 1902

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

Localities: FN98: Gluharska River, tributary of the Botunya River, 500 – 1000 m a.s.l. (Braasch & Joost, 1971a: 270); GN08: Leva River, tributary of the Botunya River, 500 m a.s.l. (Braasch & Joost, 1971b: 60).

Genus *Protonemura* Kempny, 1898

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

Localities: FN98: Gluharska River, tributary of the Botunya River, 500 – 1000 m a.s.l. (Braasch & Joost, 1971a: 275); FN98: Gluharska River, N 43^0 10' 27.0" and E 23^0 27' 15.3", 608 m a.s.l., 12.06.2013; FN99: Cherna River, above Dolno Ozirovo Village, N 43^0 14' 18.2" and E 23^0 21' 33.9", 278 m a.s.l., 12.06.2013; GN08: Desna River, above the mine, N 43^0 09' 30.5" and E 23^0 29' 14.9", 801 m a.s.l., 11.06.2013.

***Protonemura praecox praecox* (Morton, 1894)**

Localities: FN98: Gluharska River, tributary of the Botunya River, 500 – 1000 m a.s.l. (Braasch & Joost, 1971a: 270); FN98: Gluharska River, N 43^0 10' 27.0" and E 23^0 27' 15.3", 608 m a.s.l., 12.06.2013; GN08: Leva River, tributary of the Botunya River, 500 m a.s.l. (Braasch & Joost, 1971b: 60).

Genus Nemoura Latreille, 1796

***Nemoura braaschi* Joost, 1970**

Localities: FN98: tributary of the Botunya River, 500 – 1000 m a.s.l. (Braasch & Joost, 1971a: 270); GN08: Leva River, tributary of the Botunya River, 500 m a.s.l. (Braasch & Joost, 1971b: 60).

Note: From a zoogeographical point of view *N. braaschi* is Balkan endemic.

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

Localities: FN98: Gluharska River, tributary of the Botunya River, 500 – 1000 m a.s.l. (Braasch & Joost, 1971a: 271); GN08: Leva River, tributary of the Botunya River, 500 m a.s.l. (Braasch & Joost, 1971b: 61).

***Nemoura flexuosa* Aubert, 1949**

Localities: GN08: Leva River, tributary of the Botunya River, 500 m a.s.l. (Braasch & Joost, 1971b: 61); GN08: Leva River, above Zgorigrad Town, N 43^0 10' 10.3" and E 23^0 30' 21.6", 564 m a.s.l., 11.06.2013.

***Nemoura subtilis* Klapálek, 1895**

Localities: FN98: Gluharska River, tributary of the Botunya River, 500 – 1000 m a.s.l. (Braasch & Joost, 1971a: 273).

***Nemoura uncinata* Despax, 1934**

Localities: FN98: Gluharska River, tributary of the Botunya River, 500 – 1000 m a.s.l. (Braasch & Joost, 1971a: 271); GN08: Leva River, tributary of the Botunya River, 500 m a.s.l. (Braasch & Joost, 1971b: 61).

Family Perlodidae Klapálek, 1909

Genus *Perlodes* Banks, 1903

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

Localities: FN98: Gluharska River, tributary of the Botunya River, 500 – 1000 m a.s.l. (Braasch & Joost, 1971a: 282).

Genus *Isoperla* Banks, 1906

***Isoperla belai* Illies, 1963**

Localities: FN98: Gluharska River, tributary of the Botunya River, 500 – 1000 m a.s.l. (Braasch & Joost, 1971a: 283); GN08: Leva River, tributary of the Botunya River, 500 m a.s.l. (Braasch & Joost, 1971b: 63).

Note: From a zoogeographical point of view *I. belai* is Balkan endemic.

***Isoperla buresi* Rauser, 1962**

Localities: FN98: Gluharska River, tributary of the Botunya River, 500 – 1000 m a.s.l. (Braasch & Joost, 1971a: 283); GN08: Desna River, above the mine, N 43^0 09' 30.5" and E 23^0 29' 14.9", 801 m a.s.l., 11.06.2013

***Isoperla tripartita tripartita* Illies, 1954**

Localities: GN08: Leva River, tributary of the Botunya River, 950 m a.s.l. (Braasch & Joost, 1971a: 284).

Family Chloroperlidae Okamoto, 1912

Genus *Siphonoperla* Zwick, 1967

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

Localities: FN98: Gluharska River, tributary of the Botunya River, 500 – 1000 m a.s.l. (Braasch & Joost, 1971a: 288); GN08: springs of the Botunya River, near Vratsa Town (Braasch & Joost, 1971b: 64).

***Siphonoperla torrentium transsylvanica* (Kis, 1963)**

Localities: FN98: Gluharska River, tributary of the Botunya River, 800 m a.s.l. (Braasch & Joost, 1971a: 289; Gueorguiev *et al.* 1998: 174).

Note: *S. torrentium transsylvanica* is a rare species.

Family Perlidae Latreille, 1802

Genus *Perla* Geoffroy, 1762

***Perla abdominalis* Burmeister, 1839**

Localities: FN98: Gluharska River, tributary of the Botunya River, 500 – 1000 m a.s.l. (Braasch & Joost, 1971a: 285).

***Perla marginata* (Panzer, 1799)**

Localities: FN98: Gluharska River, tributary of the Botunya River, 500 – 800 m a.s.l. (Braasch & Joost, 1971a: 285).

***Perla pallida* Guérin-Méneville, 1838**

Localities: FN98: Gluharska River, tributary of the Botunya River, 500 – 800 m a.s.l. (Braasch & Joost, 1971a: 287); FN98: Gluharska River, N 43^0 10' 27.0" and E 23^0 27' 15.3", 608 m a.s.l., 12.06.2013.

Genus *Dinocras* Klapálek, 1907

***Dinocras cephalotes* (Curtis, 1827)**

Localities: FN98: Gluharska River, N 43^0 11' 35.4" and E 23^0 25' 30.0", 412 m a.s.l., 12.06.2013.

Note: First record for the Vrachanska Planina Mts.

***Dinocras megacephala* (Klapalek, 1907)**

Localities: FN98: Gluharska River, N 43^0 11' 35.4" and E 23^0 25' 30.0", 412 m a.s.l., 12.06.2013.

Note: First record for the Vrachanska Planina Mts.

Faunistic and zoogeographical notes

Presently only five localities of stoneflies are known from the Vrachanska Planina Mts., Bulgaria (Fig. 1) with a total of 20 stonefly species and seven subspecies recorded. They represent 25% of the total number (108) of the known taxa of this order in Bulgaria. The recorded taxa belong to seven families and 12 genera of the order Plecoptera.

The Nemouridae family is the richest in taxa with eight species, followed by Leuctridae and Perlidae (with five species each), Perlodidae (with four), Capniidae and Chloroperlidae (with two species each).The family Taeniopterygidae is presented only by a single species.

Plecoptera order has a moderate level of endemism. Five Balkan endemics and four rare species have been established within the territory of the Vrachanska Planina Mts. They represent 10.5% of all 38 rare stoneflies species and 22.7% of all Balkan endemics known from Bulgaria (Tyufekchieva, 2014). The endemic and rare species have a high conservation value (Table 1). Among the 27 species that have been recorded, two are Critically Endangered (CR), one is Endangered (EN) and ten are Vulnerable (VU) as classified according to the IUCN (2014) red list.

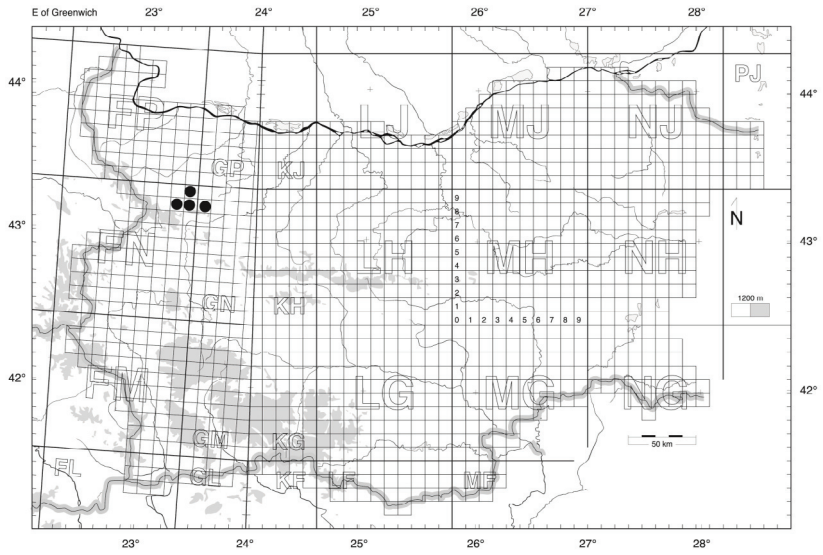

Fig. 1. UTM – grid of Plecoptera data from Vrachanska Planina Mts. Legend: FN88: Botunya River; FN98: Gluharska River; FN99: Cherna River, above Dolno Ozirovo Village; GN08: Leva River, above Zgorigrad Town; Desna River, above the mine.

Table 1. Red List of Plecoptera from the Vrachanska Planina Mts. Legend: CR– Critically Endangered; EN– Endangered; VU– Vulnerable; NT– Nearly Threatened; LC– Least Concern; DD– Data Deficient.

Taxa	IUCN categories
Taeniopterygidae	
Rhabdiopteryx neglecta neglecta (Albarda, 1889)	CR
Capniidae	
Capnia bifrons (Newman, 1839)	VU
Capnopsis schilleri balcanica Zwick, 1984	EN
Leuctridae	
Leuctra balcanica Rauser, 1965	DD
Leuctra hippopus Kempny, 1899	LC
Leuctra hirsuta Bogoescu, Tabacaru, 1960	VU
Leuctra inermis Kempny, 1899	LC
Leuctra pseudosignifera Aubert, 1954	LC
Nemouridae	
Amphinemura triangularis (Ris, 1902)	LC
Protonemura intricata intricata (Ris, 1902)	LC
Protonemura praecox praecox (Morton, 1894)	LC
Nemoura braaschi Joost, 1970	VU
Nemoura cinerea cinerea (Retzius, 1783)	LC
Nemoura flexuosa Aubert, 1949	VU
Nemoura subtilis Klapálek, 1895	VU
Nemoura uncinata Despax, 1934	NT
Perlodidae	
Perlodes microcephalus (Pictet, 1833)	LC
Isoperla belai Illies, 1963	VU
Isoperla buresi Rauser, 1962	VU
Isoperla tripartita tripartita Illies, 1954	NT
Chloroperlidae	
Siphonoperla neglecta (Rostock, 1881)	VU
Siphonoperla torrentium transsylvanica (Kis, 1963)	CR
Perlidae	
Perla abdominalis Burmeister, 1839	LC
Perla marginata (Panzer, 1799)	LC
Perla pallida Guérin-Méneville, 1838	VU
Dinocras cephalotes (Curtis, 1827)	VU
Dinocras megacephala (Klapalek, 1907)	LC

Discussion

The geographical position of Bulgaria in the southeastern corner of the European continent, the complex of paleogeographic and paleoclimatic past, combined with the presence of sufficient freshwater resources are the major driving factors favouring the existence of rich and unique Plecoptera fauna (Tyufekchieva *et al.* 2013). Based on the current knowledge of the group of stoneflies from Vrachanska Planina Mts. we consider that many of the springs are still not investigated. Therefore, we conclude that it is likely that the taxa list presented in this paper is not exhaustive.

European Plecoptera (inclusive of Bulgarian stonefly taxa) as a whole are an endangered group. Among them 43 taxa fall into three or more vulnerability categories and are the most threatened taxa from the group (Tierno de Figueroa *et al.* 2010). According to the Red List of stoneflies (IUCN, 2014), the species of *Perla abdominalis* is classified as Regionally Extinct (RE) in Italy (Fochetti *et al.* 1998) and as Critically Endangered (CR) in Switzerland (Lubini *et al.* 2012). The species of *Protonemura praecox* is classified as Endangered (EN), while *Perlodes microcephalus* is classified as Vulnerable (VU) in Serbia (Petrović *et al.* 2014). The above mentioned three species are classified as Least Concern (LC) in Bulgaria. Nevertheless, about 50% of the stoneflies from Bulgaria are regionally threatened according IUCN criteria. One species is Regionally Extinct (RE), 26 – Critically Endangered (CR), 10 – Endangered (EN) and 18 are Vulnerable (VU) (Tyufekchieva, 2014).

Moreover, according to Dunn (2005), the study of insect extinctions has been highly neglected in the past. Only 70 modern insect extinctions have been documented, whereas the same author reports that, according to a rough estimate, more than 44,000 insect extinctions may have occurred in the past 600 years.Therefore, we can speculate that the extinction rate of Plecoptera is much higher. Further investigations are needed in order to study stonefly populations and provide scientific basis for supporting their biodiversity and its conservation.

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Перли (Plecoptera, Insecta) от Врачанска планина (България)

ВИОЛЕТА ТЮФЕКЧИЕВА, ВЕСЕЛА ЕВТИМОВА, ЛЮБОМИР КЕНДЕРОВ

(Резюме)

От Врачанска планина са съобщени 20 вида и седем подвида, които принадлежат към седем семейства и 12 рода от разред Plecoptera (Insecta). Те представляват 25% от всички 108 известни до сега перли за България. Три вида се съобщават за първи път в проучвания регион. Установени са пет ендемита и четири редки вида. Определен е природозащитния статус на известните видове перли от Врачанска планина. Двадесет и седем вида са отнесени към категориите и критериите на IUCN, като два вида са "критично застрашени" (CR), един вид е „застрашен" (EN), а други десет вида са "уязвими" (VU).