



A CONTRIBUTION TO THE KNOWLEDGE OF AQUATIC HETEROPTERA IN ŠAR PLANINA MTS. AND PEŠTER PLATEAU (SERBIA)

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Abstract - New data on 10 species of aquatic Heteroptera in glacial lakes of the Šar Planina Mts. and Pešter Plateau are presented. Three species new to Serbian fauna are recorded: *Callicorixa praeusta praeusta* (Fieber, 1848) from Pešter and the vicinity of Belgrade, *Hesperocorixa parallela* (Fieber, 1860) (Corixidae) and *Notonecta maculata* Fabricius, 1794 (Notonectidae) from Šar Planina Mts. and Pešter.

KEY WORDS: Heteroptera, Nepomorpha, Gerromorpha, fauna, Serbia

Izveček – PRISPEVEK K POZNAVANJU VODNIH STENIC ŠAR PLANINE IN PLANOTE PEŠTER (SRBIJA)

Predstavljeni so novi podatki o 10 vrstah vodnih stenic (Heteroptera) v ledeniških jezerih Šar planine in planote Pešter. Zabeležene so tri nove vrste za srbsko favno: *Callicorixa praeusta praeusta* (Fieber, 1848) s Peštra in iz okolice Beograda ter *Hesperocorixa parallela* (Fieber, 1860) (Corixidae) in *Notonecta maculata* Fabricius, 1794 (Notonectidae) s Šar planine in Peštra.

KLJUČNE BESEDE: Heteroptera, Nepomorpha, Gerromorpha, favna, Srbija

Introduction

The fauna of aquatic Heteroptera of Serbia was treated in several articles (Kment 2006; Protić, Živić 2007; Živić *et al.*, 2007; Protić 2011). The zoological and hydrological studies, including collection of aquatic specimens of Heteroptera, were per-

formed in various parts of Serbia (Strahinić 2000; Šeat 2011; Živić 2005; Živić *et al.* 2001, 2002, 2004, 2006). Ecological and taxonomic studies of invertebrate benthic macrofauna in water ecosystems of the southwestern part of the Republic of Serbia were performed in the period 1996–2010 (Živić *et al.* 1996, 2010). Among the macroinvertebrate groups collected there, aquatic Heteroptera are represented.

Particularly interesting Heteroptera communities are found in isolated aquatic ecosystems, lakes and springs at higher altitudes. This paper presents the list of Heteroptera distributed in the glacial lakes of Šar Planina and springs of the Pešter Plateau.

Material and methods

Studies at Šar Planina were performed in the period September 1st 1996 – September 5th 1996, including research of glacial lakes, peat bogs and ponds. In addition to other groups of macrozoobenthos, aquatic Heteroptera were collected in five glacial lakes. The geological substrate of undulating high plain of Šar Planina, where the studied lakes are situated at the altitude of 2000–2100 m (occasionally up to 2400 m above sea level), is composed of glacial deposits – moraines (Čukić 1983), while the pedologic substrate of the terrain is typical ranker on schist (Pavičević *et al.* 1974). The saprobiological index for the studied lakes was calculated according to the algological studies (Urošević 1997a, 1997b, 1997c, 1997d). The substrate of the studied lakes of Mt. Šar-planina was overgrown with thick macrophytic vegetation. It turns certain parts of lakes into real peat bogs, which are different from the similar peat bogs of Northern and Central Europe and Central Balkans. The representation of species of Arcto-Alpine range type indicates the glacial origin of the lakes with peat domination. Peat vegetation is characterized by strong acidic reaction, which was also recorded in lakes of Šar Planina (Randjelović *et al.* 1997).

Šar Planina: Donje Tupankaminsko Jezero is situated at the altitude of 1560 m above sea level (41°54'36'' N, 20°43'27'' E). The lake is about 1 m deep, 20.5 m long and 20.7 m wide. The perimeter of the lake is approximately 29 m. It belongs to solifluction type of lakes. Water temperature was 13.6⁰ C, while saprobic level was 1.66, representing the oligo-beta meso-saprobe range.

Šar Planina: Mala Vraca (Donje Veljinbeško Jezero) is situated toward northeast, at the foothills of massif Mala Vraca (41°33'41'' N, 20°44'00'' E). This lake is about 11 m long and 7 m wide. Water depth is 30–50 cm. The substrate of the lake is mostly mud, partially overgrown in peat vegetation. Saprobic index was 1.59.

Šar Planina: Gornje Veljinbeško Jezero is situated on the plateau Veljin Beg, at the altitude of 2085 m above sea level (41°53'26'' N, 20°43'25'' E). This lake has no tributaries and is fed by snow thawing. Peat deposits are present in certain parts. The banks of the lake are overgrown with moss and sedge, while the lake is surrounded by meadow associations formed by species *Nardus stricta*. The water temperature as 9.3⁰ C while the saprobic index was 1.42 (oligo-beta mesosaprobe range of water quality) and pH was 3.5.



Fig. 1: Pešter Plateau: Spring Braćak.
Foto: N. Živić



Fig. 2: Pešter Plateau: Spring Dobra Voda. Foto: N. Živić

Šar Planina: Gornje Defsko Jezero is situated at the altitude of 2100 m above sea level (41°52'49'' N, 20°43'04'' E). It is almost circular in shape, 100 m long, 80 m wide and 50 cm deep. The bottom was mud-based, overgrown in sphagnum mosses. Water temperature was 12 °C.

Šar Planina: Srednje Defsko Jezero is situated at the altitude of 2080 m above sea level (41°53'16'' N, 20°43'21'' E). This lake is 120 m long, 60 m wide and about 50 cm deep. The substrate is composed of mud and sphagnum moss. Water temperature was 12.3 °C while the saprobic index was 1.37.

Studies on macroinvertebrate fauna in springs at Pešter Plateau were performed from July 5th to July 10th 2010, including 24 springs situated toward northwest from town of Tutin, at the altitude of about 1200 m above sea level.

Spring: Braćak (Fig. 1), situated close to the village with the same name. The width of the spring is about 60 cm, depth about 20 cm, and water is slightly cloudy. The substrate of the spring is mud-based, with no submerged vegetation. The dominant plant species around the spring belong to the family of grasses.

Spring: Dobra Voda (Fig. 2), situated close to the village Naboje. The width of the spring is 50 cm and water depth is 15 cm. The bottom of the spring is covered in sand, and water is clear, cool and transparent. This spring is surrounded with beech and conifer forest.

Spring: Donje Djerekarsko Vrelo (Fig. 3), situated close to village Djerekare at the foothills of mountain peak Strašijevac. The width of the spring is 1.7 m while water depth is 40 cm. The spring erupts from within a rocky cliff. The bottom of the spring is rock-based. Water is clear and cool.

Spring: Djerekarsko Vrelo (Fig. 4), situated above the village Djerekare at the foothills of Mt. Krstača. The spring comes out of the cave rearranged in the capture area of Pešter water industry. The bottom is covered in stone and gravel. Water is fast-flowing and clear.



Fig. 3: Pešter Plateau: Spring Donje Djerekarsko Vrelo. Foto: N. Živić



Fig. 4: Pešter Plateau: Spring Djerekarsko Vrelo. Foto: N. Živić

Spring: Kamenjača (Fig. 5), situated in the village Suvi Do, at the foothills of Jagodnje Brdo. The width of the spring is about 2 m and water depth is about 65 cm. The bottom of the spring is mud-based and water is slightly cloudy. There is an abundance of green algae at the surface of the water. The spring is encircled by massive limestone rocks surrounded by meadows on peat-rich soil.

The collected specimens are deposited in the Natural History Museum in Belgrade, preserved in 80 percent ethyl alcohol. The first author identified the specimens using the keys by Stichel (1955-1956), Jansson (1986), Savage (1989, 1990), Savage, Swift (1997).



Fig. 5: Pešter Plateau: Spring Kamenjača. Foto: N. Živić

Results

Nepidae Latreille, 1802

Nepa cinerea Linnaeus, 1758

Šar Planina Mts.: Donje Tupankaminsko jezero 1560m 02.09.1996. 3m leg. N. Živić;

Pešter: Spring Dobra Voda - 09.07.2010. 2 larvae, leg. N. Živić.

Distribution in Serbia: Divac (1907), Kormilev (1936), Csiki (1940), Protić (1987, 1990), Protić, Živić (2007), Šeat (2011).

In the neighboring countries it was recorded in Albania (Josifov 1986), Bosnia and Herzegovina (Apfelbeck 1891), Bulgaria (Josifov 1986), Croatia (Merdić *et al.* 2005, Protić 1998), Greece (Josifov 1986), Hungary (Boda, Soós 2010), Macedonia (Grupče 1961, Wagner 1962, Protić 1998), Montenegro (Schumacher 1914), Romania (Ilie, Ban-Calefariu 2010, Berchi *et al.* 2011) and Slovenia (Gogala 2003).

Corixidae Leach, 1815

Callicorixa praeusta praeusta (Fieber, 1848)

Pešter: Spring Braćak - 08.07.2010. 1m leg. N. Živić.

The Study Collection at the Natural History Museum in Belgrade includes a previously unpublished record from the vicinity of Belgrade: Veliko Selo, 08.07.2006, 3f leg. Aleksandar Stojanović.

In the neighboring countries it was recorded in Bulgaria (Josifov 1986), Hungary (Boda, Soós 2010), Macedonia (Grupče 1961, Wagner 1962) and Romania (Ilie, Ban-Calefariu 2010).

Hesperocorixa linnaei (Fieber, 1848)

Šar Planina Mts.: Mala Vraca (Donje Veljinbeško Jezero) 03.09.1996. 4m leg. N. Živić.

The only previous record from Serbia was from Kovin (Protić 2011).

In the neighboring countries it was recorded in Bosnia and Herzegovina (Grupče 1961), Bulgaria (Josifov 1986), Croatia (Kment, Beran 2011), Greece (Josifov 1986), Hungary (Boda, Soós 2010), Macedonia (Grupče 1961, Protić 1990), Montenegro (Horváth 1918) and Romania (Ilie, Ban-Calefariu 2010).

Hesperocorixa parallela (Fieber, 1860)

Šar Planina Mts.: Gornje Veljinbeško jezero (lake) 02.09.1996. 1m, 2f leg. N. Živić.

Pešter: Spring Dobra Voda - 09.07.2010. 1f, Spring Djerekarsko Vrelo 09.07.2010. 1f, Spring Kamenjača - 09.07.2010. 1f leg. N. Živić.

New species for Serbian fauna.

In the neighboring countries it was recorded in Albania (Josifov 1986), Bosnia and Herzegovina (Apfelbeck 1891), Bulgaria (Josifov 1986), Croatia (Merdić *et al.* 2005, Protić 1998), Greece (Josifov 1986), Macedonia (Protić 1998), Romania and Slovenia (Jansson 1995).

Sigara (Pseudovermicorixa) nigrolineata (Fieber, 1848)

Pešter: Spring Kamenjača - 09.07.2010. 1f leg. N. Živić.

The Study Collection at the Natural History Museum in Belgrade includes a previously unpublished record from the vicinity of Belgrade: Mala Moštanica: Žuto Brdo, 14.04.2007, 1f leg. Aleksandar Stojanović.

The only previous record from Serbia was from the valley of Pčinja river (Šeat 2011).

In the neighboring countries it was recorded in Albania (Josifov 1986), Bosnia and Herzegovina (Protić 1998), Bulgaria (Josifov 1986), Croatia (Protić 1998, Merdić *et al.* 2005), Hungary (Boda, Soós 2010), Macedonia (Protić 1998), Romania (Ilie, Ban-Calefariu 2010) and Slovenia (Gogala 2003).

Sigara (Vermicorixa) lateralis (Leach, 1818)

Pešter: Spring Donje Djerekarsko Vrelo - 09.07.2010. 10m 12f leg. N. Živić.

The Study Collection at the Natural History Museum in Belgrade includes a previously unpublished record from the vicinity of Belgrade: Mala Moštanica: Žuto Brdo, 14.04.2007, 1f, leg. Aleksandar Stojanović.

Distribution in Serbia: Divac (1907), Kormilev (1936), Živojinović (1950), Protić (1990), Šeat (2011).

In the neighboring countries it was recorded in Albania (Josifov 1986), Bosnia and Herzegovina (Jaczewski 1934, Protić 1998), Bulgaria (Josifov 1986), Croatia (Protić 1998), Greece (Josifov 1986), Hungary (Soós *et al.* 2009), Macedonia (Protić 1998), Romania (Ilie, Ban-Calefariu 2010) and Slovenia (Gogala 2003).

Notonectidae Latreille, 1802*Notonecta glauca* Linnaeus, 1758

Šar Planina Mts.: Donje Tupankaminsko jezero 1560 m, 02.09.1996, 4 m, 9 f, leg. N. Živić; Šar Planina Mts.: Gornje Veljinbeško jezero 02.09.1996, 1m, 1f leg. N. Živić; Šar Planina Mts.: Srednje Defsko jezero 2080 m, 03.09.1996, 2 m 7 f, leg. N. Živić; Šar Planina Mts.: Malo Vrac jezero, 03.09.1996, 2 m 7 f, leg. N. Živić.

Distribution in Serbia: Horváth (1903), Divac (1907), Kormilev (1936), Živojinović (1950), Protić (1990), Protić, Živić (2007).

In the neighboring countries it was recorded in Albania (Josifov 1986), Bosnia and Herzegovina (Apfelbeck 1891), Bulgaria (Josifov 1986), Croatia (Merdić *et al.* 2005, Protić 1998), Greece (Josifov 1986), Hungary (Boda, Soós 2010), Macedonia (Horváth 1918, Wagner 1962, Göllner-Scheiding 1978, Protić 1998), Montenegro (Schumacher 1914), Romania (Ilie, Ban-Calefariu 2010, Berchi *et al.* 2011) and Slovenia (Gogala 2003).

Notonecta maculata Fabricius, 1794

Šar Planina Mts.: Donje Tupankaminsko jezero 1560m 02.09.1996, 1m 1f, leg. N. Živić; Gornje Veljinbeško jezero 02.09.1996, 1f, leg. N. Živić.

Pešter: Spring Braćak - 08.07.2010. 2 m, leg. N. Živić; Spring: Djerekarsko Vrelo 09.07.2010, 1 m 1 f, leg. N. Živić; Spring: Kamenjača 09.07.2010, 1 f, leg. N. Živić.

New species for Serbian fauna.

In the neighboring countries it was recorded in Albania (Josifov 1986), Bosnia and Herzegovina (Polhemus *et al.* 1995), Bulgaria (Josifov 1986), Croatia (Novak, Wagner 1951, Protić 1998, Merdić *et al.* 2005), Greece (Josifov 1986), Hungary (Soós *et al.* 2009, Boda, Soós 2010), Macedonia (Kormilev 1938, Grupče 1961, Wagner 1962, Göllner-Scheiding 1978), and Slovenia (Gogala 2003).

Gerridae Leach, 1815

Gerris (Gerris) odontogaster (Zetterstadt, 1828)

Šar Planina Mts.: Donje Tupankaminsko jezero, 1560 m, 02.09.1996, 1 m, leg. N. Živić.

Distribution in Serbia: The Collection of Heteroptera by Nikola Kormilev includes several specimens from Serbia (Protić 1990).

In the neighboring countries it was recorded in Bosnia and Herzegovina (Apfelbeck 1891), Bulgaria (Josifov 1986), Croatia (Strpić 1997, Merdić *et al.* 2005), Hungary (Boda, Soós 2010), Macedonia (Grupče 1961, Wagner 1962, Protić 1998), Montenegro (Schumacher 1914) and Romania (Ilie, Ban-Calefariu 2010, Berchi *et al.* 2011).

Gerris (Gerriselloides) asper (Fieber, 1860)

Šar Planina Mts.: Gornje Defsko jezero, 2100 m, 1m, leg. N. Živić.

Distribution in Serbia: The only previous record from Serbia was from Prokuplje (Protić 1990).

In the neighboring countries it was recorded in Bosnia and Herzegovina (Apfelbeck 1891), Bulgaria (Josifov 1986), Croatia (Horváth 1897, Strpić 1997), Hungary (Boda, Soós 2010), Macedonia (Wagner 1962) and Romania (Ilie, Ban-Calefariu 2010).

Table 1: Distribution of aquatic Heteroptera species recorded at Šar Planina and Pešter Mts. in neighboring countries: AL - Albania, BH - Bosnia and Herzegovina, BU - Bulgaria, CR - Croatia, GR - Greece, HU - Hungary, MC - Macedonia, MN – Montenegro, RO - Romania, SL - Slovenia, RS - Serbia. • recorded species, ° not recorded, asterisk * - new record for Serbia.

Species	AL	BH	BU	CR	GR	HU	MC	MN	RO	SL	RS
<i>Nepa cinerea</i> Linnaeus	•	•	•	•	•	•	•	•	•	•	•
<i>Callicorixa praeusta praeusta</i> (Fieber) *	°	°	•	°	°	•	•	°	•	°	•
<i>Hesperocorixa linnaei</i> (Fieber)	°	•	•	•	•	•	•	•	•	°	•
<i>Hesperocorixa parallela</i> (Fieber)*	•	•	•	•	•	°	•	°	°	°	•
<i>Sigara (Pseudovermicorixa) nigrolineata</i> (Fieber)	•	•	•	•	°	•	•	°	•	•	•
<i>Sigara (Vermicorixa) lateralis</i> (Leach)	•	•	•	•	•	•	•	°	•	•	•
<i>Notonecta glauca</i> Linnaeus	•	•	•	•	•	•	•	•	•	•	•
<i>Notonecta maculata</i> Fabricius*	•	°	•	•	•	•	•	°	°	•	•
<i>Gerris (Gerriselloides) asper</i> Fieber	°	•	•	•	°	•	•	°	•	°	•
<i>Gerris (Gerris) odontogaster</i> (Zetterstadt)	°	•	•	•	°	•	•	•	•	°	•
	6	8	10	9	6	9	10	4	8	5	10

Discussion and conclusions

This paper presents records of 10 species of aquatic Heteroptera collected in Šar Planina and Pešter during the complex studies of Invertebrata at these localities. The identified species belong to the families: Nepidae (1: *Nepa cinerea*); Corixidae (5: *Callicorixa praeusta praeusta*, *Hesperocorixa linnaei*, *Hesperocorixa parallela*, *Sigara (Pseudovermicorixa) nigrolineata*, *Sigara (Vermicorixa) lateralis*); Notonectidae (2: *Notonecta glauca*, *Notonecta maculata*); Gerridae (2: *Gerris asper*, *Gerris odontogaster*).

Callicorixa praeusta praeusta (Fieber), *Hesperocorixa parallela* (Fieber) and *Notonecta maculata* Fabricius are new species for Serbian fauna.

Out of the small number of species recorded in Šar Planina (7) and Pešter (6), three are common for both areas: *Nepa cinerea*, *Hesperocorixa parallela* and *Notonecta maculata*. Species *Hesperocorixa linnaei*, *Notonecta glauca*, *Gerris asper* and *Gerris odontogaster* were recorded only in Šar Planina, while following species were recorded only in the Pešter Plateau: *Callicorixa praeusta praeusta*, *Sigara (Pseudovermicorixa) nigrolineata* and *Sigara (Vermicorixa) lateralis*.

Data for three species: *Callicorixa praeusta praeusta*, *Sigara (Pseudovermicorixa) nigrolineata* and *Sigara (Vermicorixa) lateralis*, deposited in the Study Collection of Heteroptera at the Natural History Museum, are published in this paper for the first time. All these specimens were collected in 2006 and 2007 in the vicinity of Belgrade by Aleksandar Stojanović, and were also recorded in Pešter.

Table 1 presents the distribution of aquatic Heteroptera in certain neighboring countries. Only two species (*Nepa cinerea* and *Notonecta glauca*) are present in all countries of the region. The smallest number of species was recorded in Montenegro due to the smallest number of studies except for the Durmitor Mt. massif (Protić *et al.* 1990).

Šar Planina is situated on the Serbian-Macedonian border. The specimens studied were collected in the Serbian territory. There are some literature data from previous explorers who have collected material in Macedonia, and they are also citing data from Šar Planina. Horváth (1918) cites following species for this mountain: *Sigara (Vermicorixa) lateralis*, *Velia rivulorum* (Fabricius, 1775); Grupče (1961), *Arctocorisa carinata* (C. Sahlberg, 1819) while Wagner (1962) cites: *Arctocorisa carinata*, *Notonecta glauca*, *Notonecta obliqua obliqua* Thunberg, 1787 and *Gerris costae costae* (Herrich-Schaeffer, 1850).

This paper represents a contribution to the knowledge of aquatic Heteroptera in Serbia. Each new locality is important for determination of the present range of each species. Due to the altitude and geological history of studied localities it may be assumed that further systematic studies would lead to discovery of many other interesting species.

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