

WATER BUGS (HETEROPTERA) IN THE CATCHMENT AREA OF RIVER SITNICA (SERBIA)

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Abstract

This paper includes the first study of the distribution of Heteroptera in the ecologically highly threatened catchment area of Sitnica River. It is the only recipient for large amounts of waste water which alter its ecological characteristics. There were 12 species of aquatic and semiaquatic bugs recorded in 88 samples: *Nepa cinerea* Linnaeus, *Corixa punctata* (Illiger), *Sigara (Pseudovermicorixa) nigrolineata* (Fieber), *Sigara (Retrocorixa) limitata* (Fieber), *Sigara (Sigara) striata* (Linnaeus), *Sigara (Subsigara) iactans* Jansson, *Sigara (Vermicorixa) lateralis* (Leach), *Notonecta (Notonecta) glauca* Linnaeus, *Notonecta (Notonecta) viridis* Delcourt, *Aphelocheirus (Aphelocheirus) aestivalis* (Fabricius), *Mesovelis furcata* Mulsant & Rey, *Velia (Plesiovelia) caprai* Tamanini. *Sigara (Subsigara) iactans* is a new species for Serbian fauna. Among the collected specimens three species stood out: *Sigara (Sigara) striata*, *Sigara (Subsigara) iactans* and *Aphelocheirus (Aphelocheirus) aestivalis*.

KEY WORDS: water bugs, Sitnica River, Serbia

Introduction

Due to its position and form, Sitnica River is very interesting for hydrobiological studies. It originates as a confluence of two mountain rivers (Štimljanka and Sazlija) and, with a total length of 108.8 km, flows in a south-northwest direction through the central part of the Province of Kosovo and Metohija, until its confluence into Ibar River. This is the most important river of the Kosovo valley and the meeting point for the whole hydrographic network. The catchment area occupies 2861 km² and is characterized by its high potential of raw materials, favorable geographic position and configuration of terrain, traffic network and concentration of industrial-mining complexes. This river is the sole recipient for a large amount of waste water, which changes its ecological characteristics. The ecological studies of macroinvertebrate fauna in the

catchment area of Sitnica River were intensive (ŽIVIĆ, 1998; ŽIVIĆ *et al.*, 1997, 2000, 2003, 2007, 2007a). The fauna of Heteroptera has not yet been analyzed.

Material and Methods

Fauna of macrozoobenthos at Sitnica River was studied in the period 1990-1997. The collected material includes Heteroptera in samples from 1992-1994. There were 88 samples with 222 collected specimens. They were sampled with Suber net. Basic physico-chemical parameters of water were determined by using Standard methods (Federal Institute for Health Protection, 1961), but for the saprobic index they were prepared by the method of PANTLE & BUCK (1955), and for a list of bioindicators (UZUNOV *et al.*, 1988; ORTENDORFER & HOFRAF, 1983). Material was fixed on site with 96% alcohol. Water bugs were identified using the keys of ŠTUSÁK (1980) and SAVAGE (1989, 1990). Sampled material was determined by Michail JOSIFOV. The specimens are stored at his Collection at the Institute for Zoology of Bulgarian Academy of Sciences (BAN) in Sofia.

Below is the list of sites in the catchment of Sitnica River where samples were taken (Fig. 1.) several times during the study, including specimens of Heteroptera:

Site Sazlija (1) is a pond collector of communal and industrial waste water from the town of Uroševac, in the form of an open canal. The canal bed is 2-3 m wide and around 1 m deep. The banks are overgrown with vegetation, dominated by *Typha capensis*, *Urtica dioica*, *Lemna minor*, *Tanacetum vulgare*. Water flow is slow, and the water is murky, grayish-black in color, with a disagreeable odor. Average values of more important water parameters were: water velocity 0.3 m/s, pH 7.5, temperature 11.2 °C, [O₂] 5.2 mg/l, alpha-meso-saprobic value 2.6.

Štimljanka River (2) is the second constituent tributary of Sitnica. Its water originates in mountain springs through snow thawing. This river flows through numerous settlements and is therefore polluted by waste water. At the sampling site the banks are extremely steep, with a carved bed 3-5 m deep and 8-9 m wide. The water is cold, transparent, light greenish in color, fast-flowing, 70-90 cm deep and 4-5 m wide. The bottom of the river is covered in sand. Along the banks, the bottom is composed of mud and numerous pieces of urban garbage. The narrow belt along the banks is dominated by *Salix alba*, *Populus sp.*, *Sambucus nigra*, as well as by thick herbaceous vegetation. The recorded average values of more important water parameters were: water velocity 4.1 m/s, pH 7.1, temperature 10.0 °C, [O₂] 9.2 mg/l, beta-meso-saprobic value 2.2.

Site Lipljan (3) is situated 4.5 km from the meeting point of the constituent tributaries of Sitnica River: Štimljanka and Sazlija. This part of the Sitnica watercourse is surrounded by numerous human settlements. The width of the bed is 4-5 m, while the water level is 50-60 cm in summer and 80-90 cm in winter months. Water flow is distinctly slow. The water has the color of red clay, with visible pieces of urban garbage. Banks are low (1-1.5 m) and overgrown with herbaceous vegetation and sparsely distributed trees of *Salix alba* and *Populus sp.* The recorded average values of more important water parameters were: water velocity 2.8 m/s, pH 7.4, temperature 10.2 °C, [O₂] 6.9 mg/l, alpha-meso-saprobic value 2.8.

At the site near the village of Vragolija (4), Sitnica has a very low relative slope (0.70 ‰) and therefore the bed is shallow (depth of 0.5-1 m). The water flow is distinctly slow; the water has the color of red clay and the bottom is composed of mud and sand, in some places thickly overgrown with yellow water lilies (*Nymphaea*

luteum). The recorded average values of more important water parameters were: water velocity 1.1 m/s, pH 7.6, temperature 12.1 °C, [O₂] 7.1 mg/l, alpha-meso-saprobic value 2.6.

Drenica River (5) is the right tributary of Sitnica, passing through human settlements and surrounded by cultivated fields. The bed is cut into rock, 2-2.5 m high and 9-10 m wide. The water level is 20-30 cm in summer and 60-70 cm in winter months. The water is transparent, while the bottom is covered in sand and overgrown with grass along the bank. There is a belt of *Salix alba* and grass tussocks. The recorded average values of more important water parameters were: water velocity 0.9 m/s, pH 7.6, temperature 12.3 °C, [O₂] 6.5 mg/l, alpha-meso-saprobic value 2.7.

Site Obilić (6) is situated 8.5 km from site Vragolija in the middle part of the Sitnica flow. Between these two sites the river has the following tributaries: Drenica, Gračanka, Prištevka and the waste waters of the town of Kosovo Polje, while the most important are effluents from the REIK "Kosovo" in Obilić. The site chosen for sampling has accessible banks overgrown with thick shrub and herbaceous vegetation and a narrow belt of *Salix alba* and *Robinia pseudoacacia*. The left bank is steep, 2 m high, while the right bank is low (up to 60 cm). The width of the river bed is 10-12 m while the water level is 1-1.5 m. The water has a pronounced grey color. The bottom is composed of mud and silt, with deposits of coal particles and ash, grayish-black in color, with a disagreeable odor. The recorded average values of more important water parameters were: water velocity 3.1 m/s, pH 7.9, temperature 11.2 °C, [O₂] 5.2 mg/l, alpha-meso-saprobic value 2.9.

Lab River (7) is the largest right tributary of Sitnica. The sampling site is the locality of Lužane, 4 km before the confluence into Sitnica. The bank is cut in rock, 1-2 m deep, 12-15 m wide, while the water level is 60-70 cm in summer and 1-1.5 m in autumn. Water flow is slow and the water has a greenish-brown color. The bottom is composed of sand and stones. Banks are accessible, overgrown with a belt of *Salix alba* and surrounded by arable land. The recorded average values of more important water parameters were: water velocity 4.2 m/s, pH 7.5, temperature 13.5 °C, [O₂] 4.6 mg/l, beta-meso-saprobic value 2.2.

Site Nedakovac (8) marks the beginning of the lower flow of Sitnica River. The banks are accessible and overgrown with a belt of *Salix alba* and *Robinia pseudoacacia*. At this site the width of the bed of Sitnica River is 15-17 m, and after the influx of Lab the water level rises to 1-1.5 m in summer and 2-2.5 m in autumn and spring. Depending on the season, the water color may be greenish or brown. The bottom is hard and sand-based, with mud along the banks due to landslides. Macrophytes are growing in several underwater sites. The recorded average values of more important water parameters were: water velocity 6.1 m/s, pH 7.4, temperature 11.6 °C, [O₂] 6.4 mg/l, beta-meso-saprobic value 2.3.

Site Vučitrn (9) is 7 km away from the previous site. The bed is shallow and surrounded by levees, which are about 5 m high and overgrown with grass. The water flow is medium. The water color resembles red clay, and the water depth is 1-2 m depending on the time of year. The bottom is composed of sand and mud, covered with macrophytes and with a weak smell of ammonia. Industrial and communal waste waters of the town of Vučitrn and its vicinity enter the river before this site. The recorded average values of more important water parameters were: water velocity 6.5 m/s, pH 7.3, temperature 10.8 °C, [O₂] 6.5 mg/l, alpha-meso-saprobic value 2.7.

The right bank of the Sitnica near the village of Kičić (10) is particularly high (10 m), steep and grass-covered, while the left bank is lower (1-1.5 m) and overgrown with a thick belt of willows (*Salix alba*). At this profile the river bed is very wide (20-25 m) but the water level is lower (1-1.5 m). The bottom is composed of mud and sand, hard and tough, covered in vegetation. The water has the color of red clay and the flow is medium. The

recorded average values of more important water parameters were: water velocity 6.2 m/s, pH 7.3, temperature 10.3 °C, [O₂] 6.6 mg/l, alpha-meso-saprobic value 2.7.

The site Kosovska Mitrovica (11) is situated 1 km from confluence of Sitnica River into the Ibar River. At this site the banks are steep and 5-7 m high, overgrown with grass with belts of *Robinia pseudoacacia* and *Salix alba*. The river bed is 12-15 m wide. The water is brownish in color and the water level is about 2 m. The bottom is composed of sand and mud, light-colored. Waste water from Trepča factory of superphosphates is released in front of this site. The recorded average values of more important water parameters were: water velocity 6.3 m/s, pH 7.3, temperature 10.8 °C, [O₂] 6.7 mg/l, alpha-meso-saprobic value 2.6.

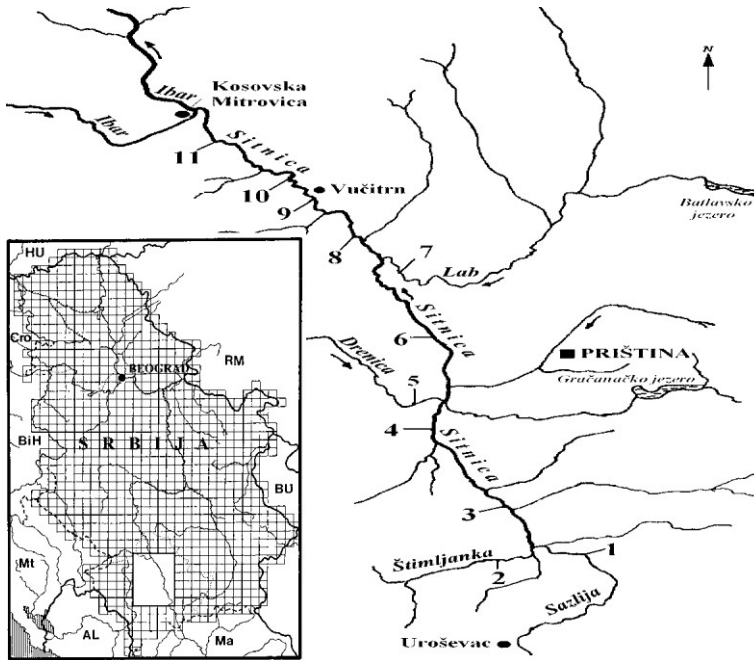


Figure 1. Sitnica River basin with sampling localities.

Results

The order of species in the list is according to the Catalogue of the Heteroptera of the Palearctic Region (AUKEMA & RIEGER, 1995).

Nepidae Latrille, 1802

Nepa cinerea Linnaeus, 1758

Sitnica: Lipljan 12.10.1993, 2 ex, leg. N. Živić.

Corixidae Leach, 1815

Corixa punctata (Illiger, 1807)

Sitnica: Nedakovac 23.11.1993, 2 ex, leg. N. Živić.

Sigara (Pseudovermicorixa) nigrolineata (Fieber, 1848)

Sitnica: Lipljan, 04.11.1992, 4 ex, 23.11.1993, 2 ex; Sitnica: Nedakovac, 23.11.1993, 2 ex, leg. N. Živić.

Sigara (Retrocorixa) limitata (Fieber, 1848)

Sitnica: Nedakovac, 30.09.1992, 4 ex, 12.10.1993, 3 ex, leg. N. Živić.

Sigara (Sigara) striata (Linnaeus, 1758)

Sitnica: Sazlija, 12.10.1993, 2 ex; Reka Drenica: Drenica, 30.04.1992, 12 ex, 12.10.1993, 11 ex; Reka Lab: Lužane, 11.05.1994, 2 ex; Sitnica: Obilić, 04.11.1992, 2 ex; Sitnica: Nedakovac, 17.06.1992, 10 ex, 30.09.1992, 8 ex, 28.07.1993, 17 ex, 12.10.1993, 4 ex; Sitnica: Vučitrn, 30.09.1992, 7 ex, 04.11.1992, 4 ex, 12.10.1992, 6 ex, 23.11.1993, 1 ex; Sitnica: Kičić, 30.09.1992, 6 ex, 04.11.1992, 2 ex, 12.10.1993, 3 ex, 23.11.1993, 3 ex; Sitnica: Kosovska Mitrovica, 04.11.1992, 6 ex, 23.11.1993, 6 ex, leg. N. Živić.

Sigara (Subsigara) iactans Jansson, 1983

Reka Drenica: Drenica, 12.10.1993, 2 ex; Sitnica: Nedakovac, 04.11.1992, 3 ex, 12.10.1993, 3 ex, 23.11.1993, 1 ex; Sitnica: Vučitrn, 30.09.1992, 8 ex, 12.10.1993, 5 ex, 23.11.1993, 1 ex; Sitnica: Kičić, 30.09.1992, 4 ex, 12.10.1993, 3 ex, leg. N. Živić.

Sigara (Vermicorixa) lateralis (Leach, 1818)

Reka Štimljanka: Štimlje, 12.10.1993, 2 ex; Sitnica: Nedakovac, 30.09.1992, 7 ex, 04.11.1992, 2 ex, 12.10.1993, 3 ex, 23.11.1993, 1 ex; Sitnica: Vučitrn, 12.10.1993, 4 ex, leg. N. Živić.

Aphelocheiridae Fieber, 1851

Aphelocheirus (Aphelocheirus) aestivalis (Fabricius, 1794)

Reka Lab: Lužane, 30.09.1992, 2 ex, 12.10.1993, 2 ex, 11.05.1994, 18 ex, leg. N. Živić.

Notonectidae Latreille, 1802

Notonecta (Notonecta) glauca Linnaeus, 1758

Sitnica: Sazlija, 23.11.1993, 2 ex, leg. N. Živić.

Notonecta (Notonecta) viridis Delcourt, 1909

Sitnica: Nedakovac, 23.11.1993, 2 ex, leg. N. Živić.

Mesoveliidae Douglas & Scott, 1867

Mesovelgia furcata Mulsant & Rey, 1852

Sitnica: Obilić, 12.10.1993, 3 ex; Sitnica: Kosovska Mitrovica, 12.10.1993, 2 ex, leg. N. Živić

Veliidae Brullé, 1836

Velia (Plesiovelia) caprai Tamanini, 1947

Reka Lab: Lužane, 11.05.1994, 3 ex, leg. N. Živić.

Discussion and Conclusions

There were 12 species of aquatic and semiaquatic bugs from six families found in the catchment area: Nepidae (*Nepa cinerea*), Velidae (*Velia (Plesiovelia) caprai*), Corixidae (*Corixa punctatam*, *Sigara (Pseudovermicorixa) nigrolineata*, *Sigara (Vermicorixa) lateralis*, *Sigara (Sigara) striata*, *Sigara (Subsigara) iactans*, *Sigara (Retrocorixa) limitata*), Notonectidae (*Notonecta (Notonecta) viridis*, *Notonecta glauca*), Aphelocheiridae (*Aphelocheirus (Aphelocheirus) aestivalis*), Mesoveliidae (*Mesovelia furcata*) (Tab. I).

Table I. Reference – previous papers on distribution of aquatic and semiaquatic bugs studied in the catchment of Sitnica River in Serbia.

| List of species | Earlier records in Serbia (references) |
|---|--|
| <i>Nepa cinerea</i> | DIVAC (1907), KORMILEV (1936), CSIKI (1940), PROTIĆ (1990), ŽIVIĆ (2007), ŠEAT (2011) |
| <i>Corixa punctata</i> | LANGHOFFER (1899), HORVÁTH (1897), KORMILEV (1936), PROTIĆ (1990) |
| <i>Sigara (Pseudovermicorixa) nigrolineata</i> | ŠEAT (2011), PROTIĆ & ŽIVIĆ (<i>in press</i>) |
| <i>Sigara (Retrocorixa) limitata</i> | HORVÁTH (1897), KORMILEV (1936), PROTIĆ (1990) |
| <i>Sigara (Sigara) striata</i> | KORMILEV (1936), ŽIVOJINOVIĆ (1950) |
| <i>Sigara (Subsigara) iactans</i> | - (new species for Serbian fauna) |
| <i>Sigara (Vermicorixa) lateralis</i> | DIVAC (1907), KORMILEV (1936), ŽIVOJINOVIĆ (1950), PROTIĆ (1990), PROTIĆ & ŽIVIĆ (<i>in press</i>) |
| <i>Notonecta (Notonecta) glauca</i> | HORVÁTH 1903, DIVAC 1907, ŽIVOJINOVIĆ 1950, PROTIĆ (1990), PROTIĆ & ŽIVIĆ (2007, <i>in press</i>) |
| <i>Notonecta (Notonecta) viridis</i> | ŽIVOJINOVIĆ (1950), PROTIĆ (1990) |
| <i>Aphelocheirus (Aphelocheirus) aestivalis</i> | ŽIVIĆ <i>et al.</i> (2007), PROTIĆ & ŽIVIĆ (2007) |
| <i>Mesovelia furcata</i> | PROTIĆ (2011) |
| <i>Velia (Plesiovelia) caprai</i> | PROTIĆ & ŽIVIĆ (2007) |

Sigara (Subsigara) iactans is a new species for fauna of Serbia. Two species were previously found only at single sites in Serbia, and they were also recorded in this study area. *Velia (Plesiovelia) caprai* was previously recorded only at Pusta Reka (PROTIĆ & ŽIVIĆ, 2007) while currently there is also a record from Lab River at site Lužane. *Mesovelia furcata* was previously recorded only in the vicinity of Belgrade (PROTIĆ, 2011) and now there is a new record from Sitnica River at the site at Obilić.

After the first record in Serbia (ŽIVIĆ *et al.*, 2007), *Aphelocheirus (Aphelocheirus) aestivalis* is now recorded for the second time at Lab River at the site at Lužane. In comparison with the first record of *A. aestivalis* in Serbia (in the catchment area of Južna Morava River), Lab River at the site at Lužane is deeper and cooler, while the saprobity index had approximately the same values close to 2.

Notonecta (Notonecta) viridis used to be periodically recorded in Serbia at intervals of several decades (ŽIVOJINOVIĆ, 1950; PROTIĆ, 1990). In the neighbouring countries it was recorded at several localities in Macedonia (PROTIĆ, 1998), Bulgaria (JOSIFOV, 1999), Slovenia (GOGALA, 2003), Hungary (BODA & SOÓS, 2010), Croatia (KMENT & BERAN, 2011), Romania (ILIE & BAN-CALEFARIU, 2010; BERCHI *et al.*, 2011).

Species with the greatest abundance in the samples (Tab. II) were: *Sigara (Sigara) striata*, *Sigara (Subsigara) iactans* and *Aphelocheirus (Aphelocheirus) aestivalis*. *S. striata* definitely had the greatest abundance - 55% of all specimens collected in the catchment area of Sitnica River.

Table II. Representation of aquatic and semiaquatic bugs in the catchment of Sitnica River.

| No. | List of species | Sitnica | Lab | Drenica | Štimljanka |
|-----|---|---------|-----|---------|------------|
| 1. | <i>Nepa cinerea</i> | • | | | |
| 2. | <i>Corixa punctata</i> | • | | | |
| 3. | <i>Sigara (Pseudovermicorixa) nigrolineata</i> | • | | | |
| 4. | <i>Sigara (Retrocorixa) limitata</i> | • | | | |
| 5. | <i>Sigara (Sigara) striata</i> | • | | | |
| 6. | <i>Sigara (Subsigara) iactans</i> | • | | • | |
| 7. | <i>Sigara (Vermicorixa) lateralis</i> | • | | | • |
| 8. | <i>Aphelocheirus (Aphelocheirus) aestivalis</i> | | • | | |
| 9. | <i>Notonecta (Notonecta) glauca</i> | • | | | |
| 10. | <i>Notonecta (Notonecta) viridis</i> | • | | | |
| 11. | <i>Mesovelgia furcata</i> | • | | | |
| 12. | <i>Velia (Plesiovelia) caprai</i> | | • | | |

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ВОДЕНЕ СТЕНИЦЕ У СЛИВУ РЕКЕ СИТНИЦЕ (СРБИЈА)

ЉИЉАНА ПРОТИЋ И НЕБОЈША ЖИВИЋ

Извод

По први пут је обрађена дистрибуција водених стеница (Heteroptera) у еколошки веома угроженом сливу реке Ситнице. Она је једини реципијент за велике количине отпадних вода које мењају њене еколошке особине. У 88 узорака идентификовано је 12 врста Heteroptera: *Nepa cinerea* Linnaeus, *Corixa punctata* (Illiger), *Sigara (Pseudovermicorixa) nigrolineata* (Fieber), *Sigara (Retrocorixa) limitata* (Fieber), *Sigara (Sigara) striata* (Linnaeus), *Sigara (Subsigara) iactans* Jansson, *Sigara (Vermicorixa) lateralis* (Leach), *Notonecta (Notonecta) glauca* Linnaeus, *Notonecta (Notonecta) viridis* Delcourt, *Aphelocheirus (Aphelocheirus) aestivalis* (Fabricius), *Mesovelis furcata* Mulsant & Rey, *Velis (Plesiovelis) caprai* Tamanini.

Sigara (Subsigara) iactans је нова врста за фауну Србије.

По броју уловљених примерака издвојиле су се три врсте: *Sigara (Sigara) striata*, *Sigara (Subsigara) iactans* и *Aphelocheirus (Aphelocheirus) aestivalis*.

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