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A PRELIMINARY ASSESSMENT OF WATER QUALITY OF SOME SMALLER WATERCOURSES FROM SREM (VOJVODINA, SERBIA) BASED ON AQUATIC MACROINVERTEBRATES

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ABSTRACT

The investigation of small watercourses in the province of Srem was performed in November of 2015 on six localities situated at three streams. Based on recorded macroinvertebrates communities herein we provide a water quality assessment based on following metrics: total number of taxa, saprobic index, BMWP, ASPT, diversity index and percentage participation of Oligochaeta in the total macroinvertebrate community. A very low water quality was assessed downstream larger settlements (Inđija and Ruma). Our results could indicate that industrial and urban wastewaters probably act as the main treats to investigated watercourses. As only the one season (autumn) was covered in this investigation, a prolonged research is needed for more reliable data.

Key words: ecological status, saprobic indices, biotic indices, small watercourses, Pannonian Plain.

INTRODUCTION

The Pannonian Plain is a central part of the Danube basin. In Serbia it covers northern part of the country (Vojvodina). Some of the largest European rivers, such as the Danube, Sava, and Tisa Rivers flow throughout this region, alongside with number of smaller, mostly, man-made watercourses (canals) such as the Danube-Tisa-Danube (DTD) canal-network.

The south-eastern part of Vojvodina, bordered by the Danube (on the North and the East) and the Sava River (on the South), is called Srem. From the southern slopes of the Pannonian island mountain – the Fruška Gora, a numerous small watercourses (streams) arise and flow, making a unique hydrological network [1, 2].

Being one of more densely populated regions in Serbia and with large areas of agricultural lands it is not surprising that watercourses in this region are under heavy anthropogenic influences. As the main treats to these smaller aquatic habitats agricultural runoff, irrigation and canalisation, communal and industrial waste waters, could be singled out [1].

Watercourses in this region are rarely investigated, particularly considering their macroinvertebrates components and ecological status/water quality. Routine ecological monitoring is conducted only in the southern part of Srem (belonging to Belgrade region) [3].

European legislative had been set standards regarding quality of surface waters [4] and based on these recommendations in Serbia has been developed and applied a national legislative [5].

Aim of this work is to contribute to knowledge regarding usability of aquatic macroinvertebrates for water quality assessment in small watercourses of central Srem.

MATERIAL AND METHODS

The benthic samples were taken in November of 2015 at three small watercourses in Srem, covering six sampling sites in total (figure 1). The AQEM protocol [6, 7] was applied and semi-quantitative sampling was performed by using a standard benthological hand net (25x25 cm, 500 µm mesh size). Samples were preserved using 60 - 80% ethanol solution and further processed in the laboratory for hydroecology and water protection of the institute for biological research „Siniša Stanković" in Belgrade. Identification to the lowest taxonomic level (preferably species level) for the main taxonomic groups was done by using appropriate taxonomic keys.

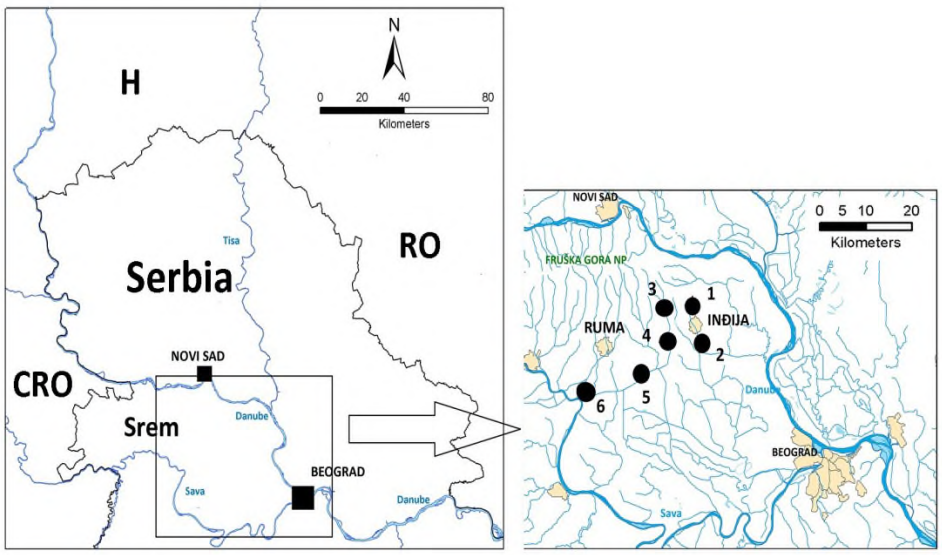

Figure 1. Investigated localities

In order to assess water quality and ecological status of investigated localities, the following metrics were used: total number of taxa, Zelinka and Marvan Saprobic Index [8], Biological Monitoring Working Party (BMWP) Score, ASPT-Average Score per Taxon [9], Diversity index H [10] and percentage participation of

Oligochaeta/Tubificidae in the total macroinvertebrate community. For saprobiological analyses, a list of bioindicator organisms according to Moog was applied [11]. The metrics calculation was performed using ASTERICS software [6]. Indicative status assessment was carried out according to the national legislation [5], based on the class boundaries for Type 5 watercourses (watercourses in the Pannonian plain, except the watercourses of Type 1).

RESULTS AND DISCUSSION

During our investigation a total of 80 macroinvertebrates taxa were determined. The majority of recorded taxa with known saprobiological preferences belong to α - mesosaprobic and β –mesosaprobic organisms, tolerating a certain degree of organic pollution.

The total number of taxa per sample ranged from 2 (sampling site 2 – downstream Inđija) to 37 (sampling site 1 – upstream Inđija) (table 1). Saprobic index (SI) ranged from 2.14 (sampling site 5) to 2.66 (sampling site 1). It should be noted that due to low number of taxa found and inadequate taxonomic resolution (family) this index was not calculated for two sampling sites (sampling sites 2 and 6). Values of BMWP and ASPT metrics ranged from 3 (sampling site 2) to 112 (sampling site 1) and from 1.5 (sampling site 2) to 5.43 (sampling site 4), respectively. Calculated values of H-diversity index ranged from 1.65 (locality 6 - Jarak) to 2.86 (locality 3 - Maradik downstream, Šelevrenac). It should be mentioned that for one locality (Inđija downstream) H-index could not be calculated (an only one taxon was found). Median value of used diversity index is high (2.17) and could points to diverse communities present along investigated watercourses. Taxa within class Oligochaeta and family Tubificidae were the numerous at the sampling site 6 (76.74 %) and sampling site 3 (64.65 %), while at the sampling site 4, no Oligochaeta were found.

Table 1. Values of indices used for water quality assessment at investigated localities

Locality	1	2	3	4	5	6
Number of Taxa	37	2	23	24	29	4
SI (Zelinka & Marvan)	2.66	/	2.45	2.39	2.14	/
BMWP	112	3	49	76	107	8
ASPT	4.87	1.5	4.08	5.43	5.35	2.67
H (Shannon-Wiener Index)	2.31	0	2.86	2.44	2.01	1.65
Oligochaeta [%]	20.81	33.33	64.65	0	12.11	76.74

Based on all used indices a very good (class I) and good (class II) water quality/ecological status, was recorded at three localities (sites 4, 5 and 1), while very low water quality (class V) was detected at localities 2 and 6 (table 2). Having in mind that the poorest water quality was found downstream larger settlements (Inđija and Ruma), it could be assumed that industrial and urban wastewaters represents the main treats to watercourses and their macroinvertebrates communities in this region. It should be noted that as only one seasonal aspect (an Autumn), was covered here, a prolonged investigation is needed for more reliable data.

Table 2. Water quality assessment of investigated localities based on biotic indices (according to 74/2011, type 5)

Locality	1	2	3	4	5	6
Number of Taxa	1	5	1	1	1	5
SI (Zelinka & Marvan)	3	/	2	2	2	/
BMWP	1	5	2	1	1	5
ASPT	2	5	2	1	1	4
H (Shannon-Wiener Index)	1	/	1	1	2	2
Oligochaeta [%]	2	3	4	0	2	5
ASSESSMENT	2	5	3	1	1	5

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