



University of Belgrade, Technical Faculty in Bor
29th International Conference Ecological Truth
& Environmental Research



EcoTER'22

Proceedings



Editor

Prof. Dr Snežana Šerbula

21-24 June 2022, Hotel Sunce, Sokobanja, Serbia



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PREFACE

In today's world, the environment has been endangered by the use of outdated technology, fossil fuels and environmental law violations. Therefore, environmental and many other scientists all over the world have been concerned about finding sustainable technology in resolving these issues. That is why environmental research and ecological truth are at the focus of the 29th International Conference Ecological Truth & Environmental Research 2022 (EcoTER'22), which will be held in Sokobanja, Serbia, 21–24 June 2022. On behalf of the Organizing Committee, it is a great honor and pleasure to wish all the participants a warm welcome to the Conference.

We hope to convey the message of the conference, which is that a transformation of attitudes and behavior would bring the necessary changes. This is also an opportunity for the participants who are experts in this field to exchange their experiences, expertise and ideas, and also to consider the possibilities for their collaborative research.

The 29th International Conference Ecological Truth & Environmental Research 2022 is organized by the University of Belgrade, Technical Faculty in Bor, and co-organized by the University of Banja Luka, Faculty of Technology, the University of Montenegro, Faculty of Metallurgy and Technology – Podgorica, the University of Zagreb, Faculty of Metallurgy – Sisak, the University of Pristina, Faculty of Technical Sciences – Kosovska Mitrovica and the Association of Young Researchers, Bor.

These proceedings include 85 papers from the authors coming from the universities, research institutes and industries in 6 countries: Bulgaria, Italia, Albania, Bosnia and Herzegovina, Montenegro and Serbia.

As a part of this year's conference, the 4th Student section – EcoTERS'22 is being held. We appreciate the contribution of the students and their mentors who have also participated in the Conference.

Financial assistance provided by the Ministry of Education, Science and Technological Development of the Republic of Serbia is gratefully acknowledged by the Organizing Committee of the EcoTER'22 conference.

The support of the Platinum donor and their willingness and ability to cooperate have been of great importance for the success of EcoTER'22. The Organizing Committee would like to extend their appreciation and gratitude to the Platinum donor of the Conference for their donation and support.

We appreciate the effort of all the authors who have contributed to these Proceedings. We would also like to express our gratitude to the members of the scientific and organizing committees, reviewers, speakers, chairpersons and all the Conference participants for their support to EcoTER'22. Sincere thanks go to all the people who have contributed to the successful organization of EcoTER'22.

Prof. Snežana Šerbula,

President of the Organizing Committee

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INDICATIVE ECOLOGICAL STATUS ASSESSMENT BASED ON EPILITHIC DIATOMS OF SMALL RIVERS AT ROGOZNA MOUNTAIN

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Abstract

Epilithic diatom community investigation of small rivers at Rogozna Mountain was conducted in order to create baseline for future surveys, since hydrobiological data are lacking. Diatom sampling and analysis was performed according to the guidance of national standards and regulations. Indicative ecological status was determined by the IPS diatom index. At investigated area a total number of 49 diatom taxa were identified. The most frequent and abundant taxa, such as Achnantheidium minutissimum, Meridion circulare and Navicula lanceolata are common for the hilly-mountain watercourses. Qualitative and quantitative analysis of diatom samples have shown excellent and good indicative ecological status of small rivers of Rogozna Mountain.

Keywords: epilithic diatoms, hilly-mountain river, ecological status

INTRODUCTION

Benthic diatoms are well known as bioindicators of changes in water quality: they have short generation time, well studied ecological preferences, broad distribution, they are present in heterogeneous microhabitats, and sampling and analysis methods are standardized [1]. Diatom based bioassessment in Serbia is regulated by the national laws and covers all river types [2,3].

Rogozna Mountain in south-western Serbia has at all times been known for its natural ores, forests and thermo-mineral springs [4]. This mountain follows a north-western to south-eastern orientation, with the highest peak Crni Vrh with altitude of 1504 m. Its geological structure is largely represented by serpentine and eruptive stones [5]. Rogozna Mountain is surrounded by the Ibar River on the south, east and northeast, and the Raška and Jošanica Rivers on the northwest. Considering diversity and water quality of streams at Rogozna Mountain, there is no data. Conducted investigation of epilithic diatom community included small rivers the Barska reka, Karavansalijska reka, Kašaljska reka (the Ibar River basin) and the Netvički potok (the Raška River basin). Study area was selected in order to estimate indicative ecological status of watercourses, and to support hydrobiological reference point data due to potential mining activities.

MATERIALS AND METHODS

Benthic diatoms were sampled during April and September 2021 from the eight localities at surveyed watercourses: two at the Barska reka, two at the Karavansalijska reka, three at the Kašaljska reka, and one at the Netvički potok. Samples were collected from cobbles and stones that were submerged in the water, according to standard SRPS EN 13946: 2015 [6]. Material was preserved with formaldehyde to the final concentration of 4%. In laboratory, phytobenthos samples were exposed to a hot acid method, afterwards permanent diatom slides were made by using Naphrax® mounting medium [6]. Diatom slides were observed and photographed with microscope Zeiss Axio Lab1 with AxioCam ERc 5s camera and ZEN software. Qualitative and quantitative analysis, and interpretation of results were performed according to the SRPS EN 14407: 2015 [7]. Identification was done by standard algological literature, and relative abundance of diatom taxa was determined by counting 400 valves at each slide. OMNIDIA software [8] was used to calculate diatom indices. Ecological status classes based on IPS index [9] were determined by national regulations [2,3].

RESULTS AND DISCUSSION

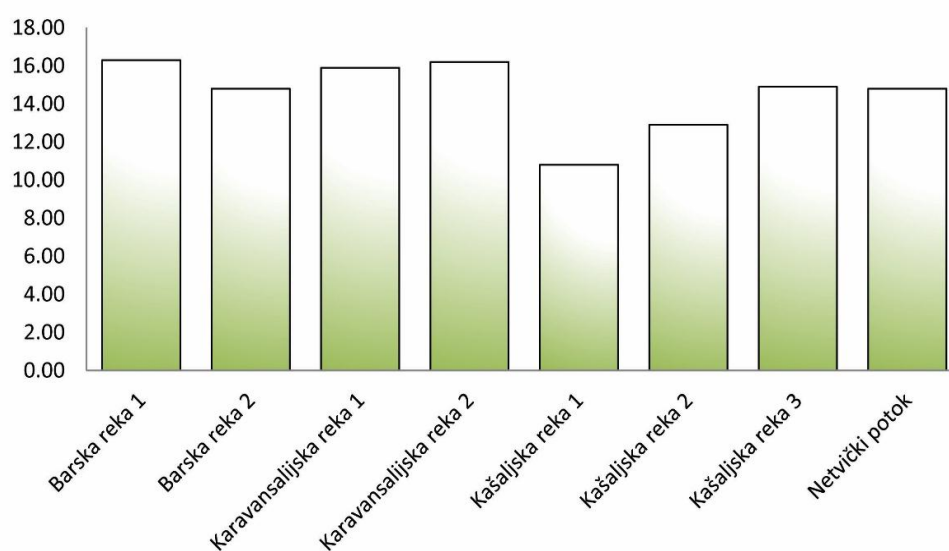
At investigated area of Rogozna Mountain, altogether 49 diatom taxa were identified, belonging to 26 genera. Diatom taxa richness was the greatest in the river Kašaljska reka (31 taxa), while in the rivers Barska reka, Karavansalijska reka and Netvički potok was uniform (22, 20 and 22, respectively). The most frequent species in the diatom communities of investigated rivers were *Achnanthydium minutissimum* (Kützing) Czarnecki, *A. subatomoides* (Hustedt) Monnier, Lange-Bertalot et Ector, *Adlafia minuscula* (Grunow) Lange-Bertalot, *Gomphonema micropus* Kützing, *Meridion circulare* (Greville) C.A. Agardh, *Navicula lanceolata* (Agardh) Ehrenberg, *Nitzschia dissipata* (Kützing) Grunow, *N. palea* (Kützing) W.Smith and *Planothydium lanceolatum* (Brébisson ex Kützing) Lange-Bertalot.

In analysed material, 12 diatom taxa had relative abundance higher than 5% per sample (Table 1). Some of the most frequent taxa of studied watercourses were also dominant and/or subdominant in the significant number of samples, such as *A. minutissimum*, *M. circulare* and *N. lanceolata* (Table 1). *A. minutissimum* is cosmopolitan diatom, usually reported in small hilly-mountain watercourses, in wide trophic spectrum [10]. *M. circulare* is also very common in running waters, and prefers lower trophic levels. *N. lanceolata* has wide ecological amplitude, from oligo- to α -mesosaprobic waters, and favours higher trophic levels. Both *M. circulare* and *N. lanceolata* are characteristic for lower temperature waters, and can be very abundant in the spring months [11,12], when the most samples from rivers of Rogozna Mountain were collected.

Table 1 Diatom taxa with relative abundance higher than 5% per sample

Taxa / Locality	Barska reka 1	Barska reka 2	Karavans. reka 1	Karavans. reka 2	Kašaljska reka 1	Kašaljska reka 2	Kašaljska reka 3	Netvički potok
<i>Achnantheidium minutissimum</i>	28.01	6.86	8.36	43.53		18.14	13.05	19.41
<i>Fragilaria capucina</i>	16.9	9.69						
<i>Gomphonema micropus</i>	9.26	14.18		16.52	11.41	5.39		
<i>Meridion circulare</i>	19.44	12.29	18.02	26.56	5.58	9.07		9.34
<i>Navicula lanceolata</i>	5.56	11.82	7.83		30.83	19.85	50.35	
<i>Achnantheidium subatomoides</i>		10.87		6.25				
<i>Nitzschia dissipata</i>		6.86	7.57		11.89	6.62		
<i>Odontidium mesodon</i>			23.5					
<i>Nitzschia palea</i>					14.32	6.86		
<i>Planothidium frequentissimum</i>								19.41
<i>Planothidium lanceolatum</i>								11.3
<i>Rhoicosphenia abbreviata</i>							8.86	12.53

Watercourses in the study area at Rogozna Mountain belong to the river type 6, according to national typology [2,3], thus indicative ecological status classes are determined by the IPS index values (Figure 1, Table 2).

**Figure 1** Values of IPS index at surveyed localities

Values of IPS index at localities on rivers the Barska reka, Karavansalijska reka, Netvički potok, and at the third locality at the Kašaljska reka ranged from 10.8 to 16.3, denoting the

first class of indicative ecological status, while values of IPS index at remaining localities at the Kašalj-ska reka were 10.8 and 12.9, showing the second class of indicative ecological status.

Table 2 Indicative ecological status classes of surveyed localities based on IPS index

Locality	Barska reka 1	Barska reka 2	Karavans. reka 1	Karavans. reka 2	Kašalj-ska reka 1	Kašalj-ska reka 2	Kašalj-ska reka 3	Netvički potok
Indicative ecological status class	I	I	I	I	II	II	I	I

CONCLUSION

Taxa richness and diatom community structure of the investigated watercourses at Rogozna Mountain are common for spring months at small hilly-mountain rivers, with a prevalence of larger fractions of rock substrates and direct current. Diatom community is dominated by taxa with preference to oligosaprobic and mesosaprobic waters. Qualitative and quantitative analysis of diatom samples according to the national regulations have shown excellent and good indicative ecological status of small rivers of Rogozna Mountain.

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