AN ASSESSMENT OF ECOLOGICAL POTENTIAL OF THE RADOINJA RESERVOIR (SERBIA)

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Introduction

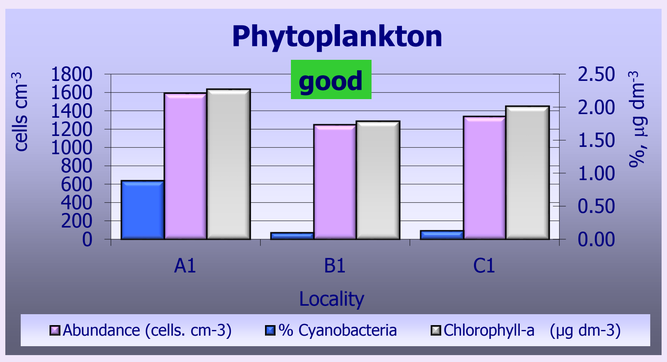
The Serbian Environmental Protecion Agency (SEPA) was carried out an investigation of the Radoinja Reservoir during 2014. Based on following biological quality elemens (BQE): phytoplankton, phytobenthos and macroinvertebrates, supporting physico-chemical quality elements and specific non-priority substances, the assessment of ecological potential of the Radoinja Resevoir is given according to national legislation. This assessment is different from previous reservoir water quality assessments. Implementation of the Water Framework Directive (WFD/2000/60/EC) had changed the criteria of water body ecological status/potential assessement.

Materials and Methods

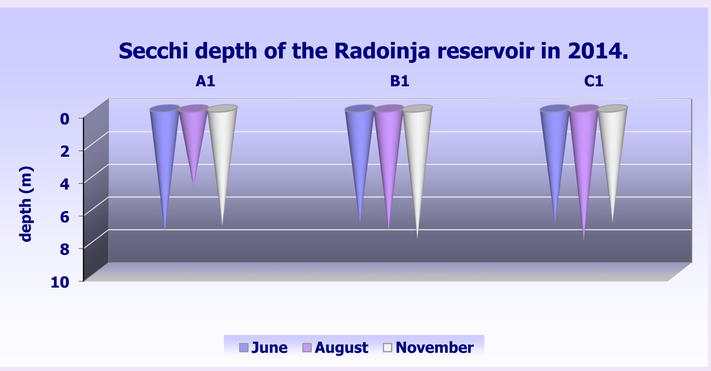
Sampling of phytobenthos and macroinvertebrates was conducted in August and October 2014. Sampling of phytobenthos (benthic diatoms) was done according to the SRPS EN 13946: 2008. The material was preserved using 4% formaldehyde. Removing of cell content and diatom slide preparation was done according to the SRPS EN 13946: 2008. The analysis of diatoms was carried out on inverted microscopes Nikon TE-2000U with the DS-5M camera and NIS-Elements D software and Zeiss Axiovert with AxioCam HRc camera and AxioVision 4.8 software. Identification and enumeration of the diatoms, as well as interpretation of the obtained results were performed according to the SRPS EN 14407: 2008. For calculation of diatom indices the Omnidia software was used. The assessment of ecological potential was based on the IPS diatom index (Coste and Cemagref, 1982).
Aquatic macroinvertebrate samples were collected using hand nets (25x25 cm; 500 µm mesh size) according to the AQEM protocol. The multi-habitat sampling procedure was applied. The samples were preserved using 70% ethanol solution. Identification of organisms was done using the Leica MS 5 stereomicroscope. For the assessment of ecological potential, the following parameters of the ASTERICS software were used: Zelinka & Marvan Saprobic Index, BMWP Score, Shannon-Wiener Diversity Index, total number of taxa, percentage participation of Oligochaeta/Tubificidae in the total macroinvertebrate community and EPT Taxa.

Results and Discussion

Investigation of diatom community revealed poor diversity (22 taxa in August and 16 taxon in October 2014 respectively). The dominant species was *Staurosira venter* (Ehrenberg) Cleve & J.D.Möller (even 54% in Aug and 45% in Oct). Subdominant species were *Achnanthidium minutissimum* (Kützing) Czarnecki, *Achnanthidium catenatum* (Bily & Marvan) Lange-Bertalot and Lange-Bertalot & Genkal and *Cocconeis placentula* Ehrenberg.
Considering aquatic macroinvertebrate community composition and structure, the total number of taxa was 13 in August and 12 in October 2014 respectively. In Aug 2014 Chironomidae and Tubificidae taxa were found to be principal components of the macroinvertebrate community, whlist in Oct 2014 the species *Dina lineata* (O.F.Müller, 1774) and the Chironomidae taxa. It is worth mentioning the finding of *Baetis lutheri* Müller-Liebenau, 1967 in Aug 2014.
The content of Dissolved Oxygen in water is the most important indicator of the ecological potential of the reservoir. In the Radoinja Reservoir there was not oxygen deficit in the hypolimnion. Physico-chemical quality elements that support BQE, as well as specific non-polluting substances indicate good ecological potential of the Radoinja Reservoir.



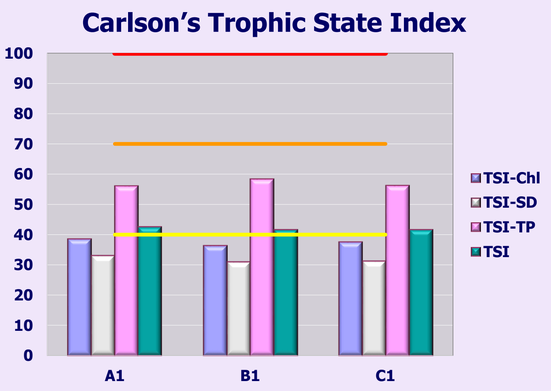
Supporting physico-chemical quality elements												
Locality	pH	Dissolved oxygen (mg dm^{-3})	BOD_5 (mg dm^{-3})	TOC (mg dm^{-3})	Ammonium-ion (NH_4-N) (mg dm^{-3})	Nitrite (NO_2-N) (mg dm^{-3})	Nitrate (NO_3-N) (mg dm^{-3})	Total nitrogen (mg dm^{-3})	Orthophosphate (mg dm^{-3})	Total phosphorus (mg dm^{-3})	Chlorides (mg dm^{-3})	ecological potential assessment
A_1	7,98	7,62	1,3	4,4	0,09	0,006	0,40	0,75	0,016	0,037	3,2	good
B_1	8,02	7,65	1,5	4,4	0,08	0,005	0,47	0,75	0,019	0,043	3,1	good
C_1	7,95	7,39	1,4	4,4	0,06	0,005	0,51	0,79	0,012	0,037	3,1	good



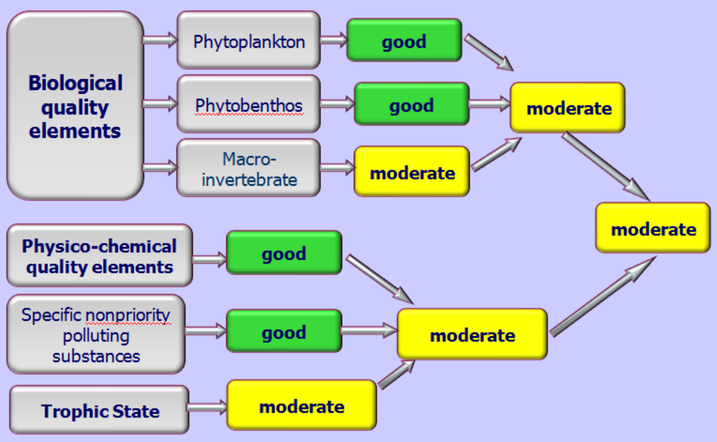
Macroinvertebrates							
Locality	Zelinka & Marvan Saprobic Index	BMWP Score	EPT Taxa	Shannon-Wiener	Oligochaeta-Tubificide (%)	total number of taxa	ecological potential assessment
A i C	2,33	28	3	2,26	23,35	13	moderate

Phytobenthos				
Locality	Diatom indices			ecological potential assessment
	EPI-D	IPS	CEE	
A	15,7	16,1	17,2	good
C	15,8	16,6	17,3	good

Staurosira venter (Ehrenberg) Cleve & J.D.Möller



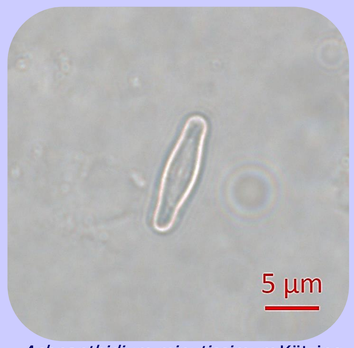
Carlson's Trophic State Index (TSI) pointed to moderate ecological potential. TSI is mostly affected by increased concentration of Total Phosphorus (TSI-TP).



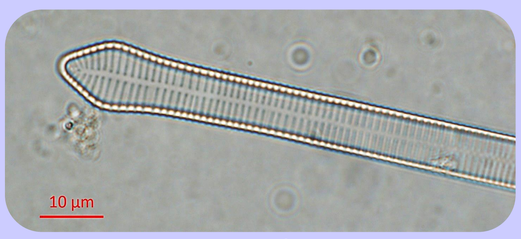
Conclusion

According to the WFD 2000/60/EC ecological potential is determined by the worst-assessed BQE. The Radoinja Reservoir had a **moderate ecological potential** in 2014 determined by the macroinvertebrates. According to national legislation, the reliability level of assessment is medium because not all BQE have been used and the frequency of biological monitoring and the monitoring of indicative physico-chemical parameters was lower than the minimally proposed for ecological status/potential assessment.
However, due to for this ecological potential assessment the parameters of those quality elements that are most sensitive to the pressures that the Radoinja Reservoir was actually exposed (nutrient and organic pollution) were used, characteristic for the operational monitoring programme by the WFD, we considered that the level of reliability of the ecological potential assessment of the Radoinja Reservoir was high.

Denticula tenuis Kützing



Achnanthidium minutissimum Kützing



Fragilaria dilatata (Bréb.) Lange-Bertalot