

PRELIMINARY ANALYSIS ON SOME PHYSICO-CHEMICAL RIVERS WATER FEATURES IN PRICOP-HUTA CERTEZE AND TISA SUPERIOARĂ PROTECTED AREAS

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ABSTRACT. - Preliminary Analysis on some Physico-Chemical Rivers Water Features in Pricop-Huta Certeze and Tisa Superioară Protected Areas. The present study is focused on the evaluation of river's water quality from two Natura 2000 protected areas located in Maramureș County, on the northern border between Romania and Ukraine. The field period deployed for the 8 water sampling points was carried out on October 31 – November 1st 2015. Each water sample was analyzed to determinate several features, using a portable multiparameter HI 9828 and a portable turbidimeter HI 98713. Also for geolocation reference has been used a GPS Magellan Explorist 600 device. The investigated parameters were: pH, water temperature and conductivity, total dissolved solids, salinity and water turbidity. The obtained results will be integrated into a more complex study on water quality, regarding the mentioned Natura 200 sites.

1. INTRODUCTION

A protected area is “a clearly defined geographical space, recognized, designated and managed on the basis of legal documents or other means effective in order to realize long-term conservation of nature as well as environmental services and cultural values associated” (IUCN, 2008). For protected areas, water quality can be a good indicator on the ecosystem health. The composition and the hydro-chemical regime of streams is in relation with the fast exchange of river bed water, with liquid runoff regime and climatic conditions, with the interaction between water and atmosphere, with the soil and the rocks situated above of the base erosion level.

The study area is focusing on two Natura 2000 sites (*Pricop-Huta Certeze* and *Tisa Superioară*) located in the northern part of Romania, Satu Mare and Maramureș Counties, on the border with Ukraine.

The first site, *Pricop-Huta Certeze*, protects a forest area, located on a transit region, between two volcanic mountains: Oaș and Igniș, with Miocene andesitic rocks. Dominated by beech forests, the site has modest altitudes, between 268 and 1104 m, while climate conditions are determined by Atlantic-Baltic influences, with rainfall average values that reach more than 700-750 mm and

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average yearly temperatures of 8–9 °C. The second site, *Tisa Superioară* includes the floodplain area and terraces on the left bank of Tisa River, which flows from east to west, making the natural border between Romania and Ukraine, for around 62 km. On the eastern part, there is a massive and compact forest, called *Pădurea Ronișoara*, which occupies an area of 62 ha.

The catchment area of Tisa River, associated with the northern part of Romania, is defined by the main collector and several streams that flow through Maramureș Depression, like: Vișeu and Iza River (Fig. 1).

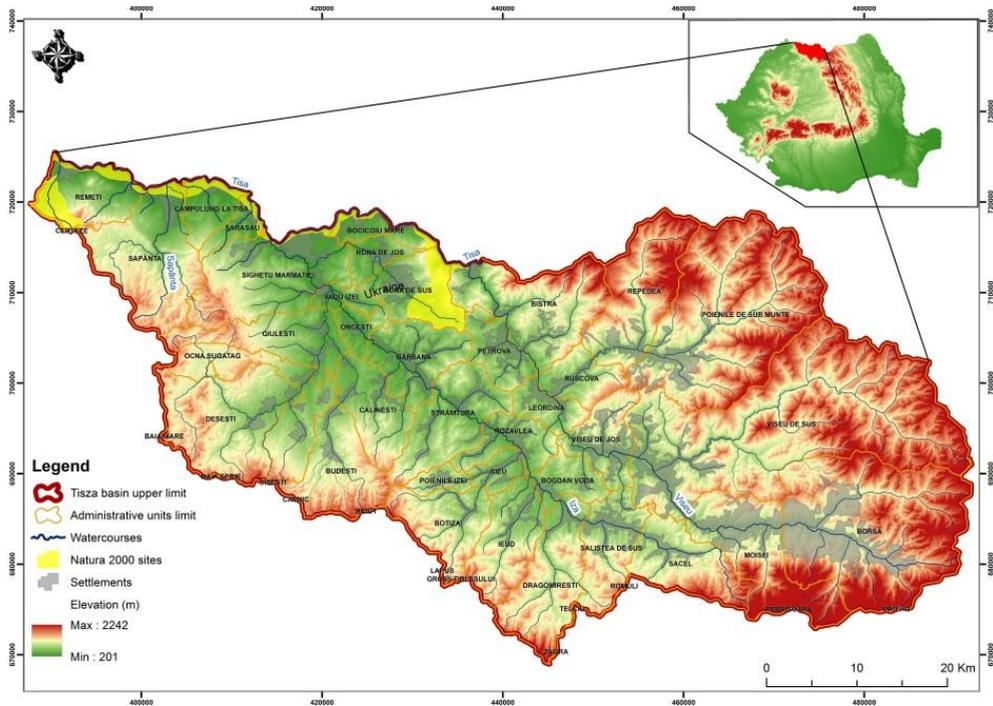


Fig. 1. Upper Tisa catchment area, associated with Maramureș Depression, with left Romanian tributaries

The geology of the studied area is represented a mix of structure and composition. Thus, in Pricop-Huta Certeze site, the basaltic and pyroxene andesites and clays with sand intercalations are the most common structures found. On the second Natura 2000 site, *Tisa Superioară*, the geology is represented by young structures, like alluvial proluvial and fluvial deposits, while on the eastern part, on *Pădurea Ronișoara*, we can find marl and sandstone from different ages (R.S.R. Geologic Maps, 1:200 000 scale). Rivers water quality is not hardly influenced by the presence of important pollution sources. The most relevant is the mining area of Baia Borșa, situated on the outside area of studied perimeter, in the upper part of Vișeu basin, in Țașla, Colbu and Novăț catchments. The mining activity has been reduced, constantly in the last years. Unfortunately, this area is known also for a

mining accident, which led to a severe pollution phenomena, which happened in March 2000. Then, the warm temperatures, important rainfalls and a consistent snow layer, where the premises for a major failure of *Novăț tailing pond dam*, which led to a pollution phenomenon that has been translated up the Tisa River (Driga, 2010). Currently, local streams, that are washing the mine tailings ponds, are still affected with important sediment loads, which led to a high turbidity, some significant values for heavy metals ions and pH value changes.

2. MATERIALS AND METHODS

The measurements of selected parameters of surface waters in the upper basin of the Tisa River, were made using the Hanna Instruments HI 9828 portable multiparameter and Hanna Instruments HI 98713, devices designed for field use.

For water sampling points we have choose eight spots, one associated with the *Pricop-Huta Certeze* site, but outside of the protected area, while the other seven were located in the *Tisa Superioară* site. The location and GPS coordinates of these points can be observed on the following map (Fig. 2).

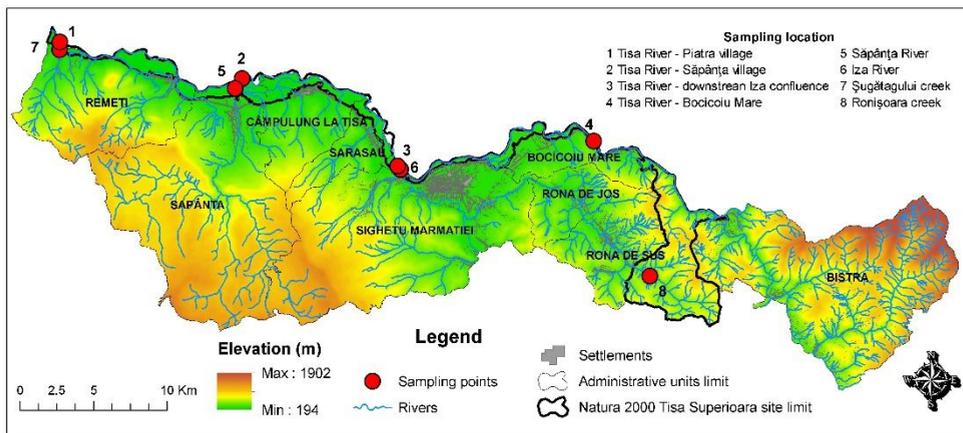


Fig. 2. Sampling points location in the studied area

The selected sampling points location was choose accordingly to the relevance for water quality evaluation and in relation with potential pollution sources. Water samples were analyzed for different features like: pH values, water temperature and electrical conductivity (EC), total dissolved solids (TDS), salinity and water turbidity. The sampling was made on October 31 – November 1st 2015.

3. RESULTS AND DISCUSSION

The average values of the monitored physico-chemical parameters are shown in Table 1. The analyzed water samples proved to be slightly alkaline, having the pH values between 7.89 and 8.74 (Fig. 3). The value recorded on

Șugătagului stream is the second highest for this campaign, while other values on Tisa River, describe a slight decrease with the altitude of the sampling points. Thus, the highest value was recorded in the upper part of stream, at Bocicioiu Mare village, while the lowest value was determined on Săpânța River, upstream of Tisa confluence.

Table 1. Recorded values of analyzed features in studied area

No.	Sampling location	pH	ORP (mV)	EC (μS. cm)	TDS (mg/l)	Sal. (‰)	Turb. (mg/l)	Temp. (°C)
1	Șugătagului Creek	8.43	-60.2	106	0.053	0.05	6.46	6.33
2	Tisa River - Piatra village	8.36	-63.4	259	0.129	0.12	16.75	7.50
3	Tisa River - Săpânța village	7.90	-52.8	280	0.140	0.13	12.10	6.41
4	Săpânța River - upstream Tisa confluence	7.89	-34.3	48	0.080	0.03	5.01	6.37
5	Iza River - upstream Tisa confluence	8.13	-37.4	65	0.032	0.03	15.10	6.49
6	Tisa River downstream of Iza confluence	8.35	-148.3	306	0.153	0.15	23.85	4.23
7	Tisa River - Bocicioiu Mare village	8.74	-145.1	228	0.114	0.11	17.05	4.45
8	Ronișoara Creek	8.27	-135.1	683	0.342	0.33	2.44	4.36

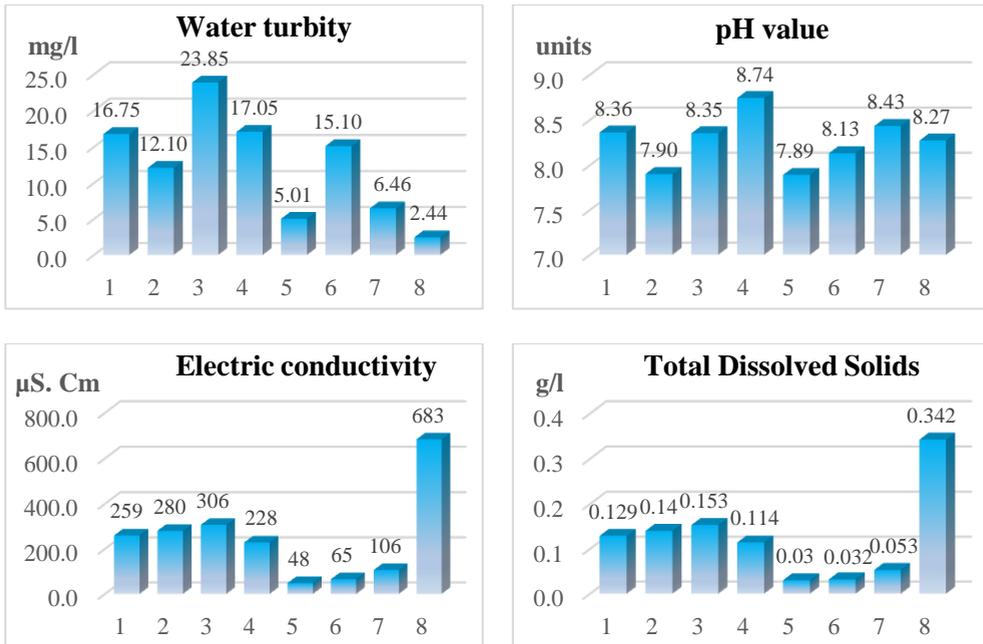
The analyzed water samples proved to have a relatively low electric conductivity, with the values between 48 and 683 μS. cm. All the analyzed water samples had the electric conductivity lower than the maximum permissible limit of 1000 μS/cm imposed by the international legislation (EPA's recommended maximum value, www.epa.gov). Using the EC classification use by Handa (1969) cited by Pișteea et al (2014), the monitored rivers are associated into the 1st and 2nd salinity hazard classes, as shown below in Table 2.

Table 2. Classification of waters based on of EC (Handa, 1969, Pișteea, 2014)

EC (μS/cm)	Salinity hazard class	Water salinity
0–250	C1	Low (excellent quality)
251–750	C2	Medium (good quality)
751–2250	C3	High (permissible quality)
2251–6000	C4	Very high
6001–10000	C5	Extremely high

Thus, the tributaries Șugătagului creek, Săpânța and Iza Rivers (sample 1, 4 and 5) have values associated with excellent quality, while other sampling points are associated with the second class, of good quality.

Water turbidity indicator is described by low levels between 2.44 mg/l (sample 8 – Ronișoara Creek) and 23.85 mg/l (sample 6 - Tisa River downstream of Iza confluence). In general, on the Tisa River sampling points we have detected higher values (over 12 mg/l), while on the tributaries, data recorded was under 7, with one exception (sample point no. 6 – Iza River, with a 15.1 mg/l value).



Sampling location

- | | | | |
|---|--|---|-------------------|
| 1 | Tisa River - Piatra village | 5 | Săpânda River |
| 2 | Tisa River - Săpânda village | 6 | Iza River |
| 3 | Tisa River - downstream Iza confluence | 7 | Şugătagului Creek |
| 4 | Tisa River - Bocicoiu Mare | 8 | Ronişoara Creek |

Fig. 3. Sampling point's analysis results in the studied area

Total dissolved solids have in general similar values for the sampling spots associated with the Tisa River location, while on the tributaries values are much lower, except the sampling point situated on Ronișoara Creek. Water salinity has the same trend, with higher values on Tisa River sampling spots, smaller values on tributaries and one exception on the creek that flows through Ronișoara forest.

CONCLUSION

The results obtained over water quality of Tisa River and some associated tributaries, during the water sampling campaign are defining a good state of water quality. Future campaigns will emphasis potential water pollution sources and chemical concentrations for several other indicators. The analyzed parameters have shown that the sampling points located on Tisa River have usually higher values for water turbidity, pH, electric conductivity, total dissolved solids and salinity.

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