Hydrosphere Protocol:

Influence of Air Temperature on Water Temperature, pH, and Chemical Substance Content in Tršljavec Stream

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SUMMARY

This research project focused on the influence of air temperature on water temperature, pH value of water and nitrate and nitrite content in the Tršljavec stream. Our aim was to determine whether there are relationships between air temperature and different water parameters.

Through field and laboratory work, we made repeated measurements of air temperature, water temperature, water pH value and nitrate and nitrite content. Based on the analysis of the data obtained, it was confirmed that air temperature has an influence on water temperature, while air temperature has no significant influence on the pH value of the water. We also found that the nitrate and nitrite content of the water is independent of the water temperature.

1. INTRODUCTION

Global warming is having a profound impact on life on Earth. Organisms are losing habitat and the ability to survive. The climate is changing and extreme weather events such as droughts, floods, etc. are occurring.

The impact of drought is seen every year in home gardens and nearby fields. We experience weather phenomena such as summer heat, winters without snow, winters with above-average temperatures, etc.

With the Tršljavec stream we wanted to investigate how air temperature affects the life in the stream.

Tršljavec

Figure 1: Location of measurements Figure 2: Tršljavec Stream

The Tršljavec stream is located 2m from the Pioneer Road in Leskovec near Krško. Around the stream there is a meadow and some trees.

Location coordinates X: 45.94307409796153, Y: 15.479788863228244

Altitude: 210 m

2. RESEARCH QUESTION AND HYPOTHESES

Research question

The aim of our study is to investigate how air temperature affects water temperature and, indirectly, water pH and nitrate and nitrite content.

Hypotheses:

1) water temperature varies in correlation with air temperature.

2) water temperature has no effect on water pH

3) the nitrate and nitrite contents depend on water temperature

3. METHODS OF WORK

Fieldwork

Once a week, at around the same time, we measured the temperature of a stream on site. Three measurements were made.

We also took a water sample which was analysed in the school laboratory. In parallel, we also measured the temperature and humidity.

Figure 3: Sample collection Figure 4: Recording measurements Figure 5: Taking measurements

Laboratory work

The pH value of the water sample was measured using a pH meter and the value of nitrate and nitrite was determined using nitrate and nitrite reagents. All measurements were carried out three times according to the established procedures. The consistency of the results was confirmed on the basis of the repeated measurements.

Figure 6: Determination of nitrate and nitrite using a water analysis case.

Figure 7: Measurement case

5. THE CORE

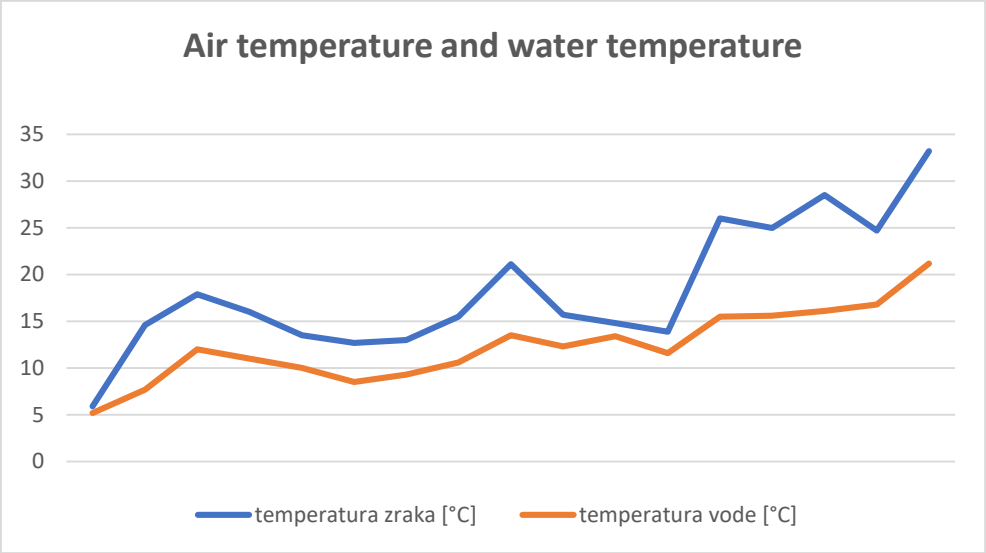
The results of our measurements are shown in graphs and a table.

Air temperature [°C]	Nitrites [NO_2]	Nitrates [NO_3]	Water temperature [°C]	pH of the water
5,9	0,02	10	5,2	6
14,6	0,02	10	7,7	7
17,9	0	5	12	7
16	0,02	10	11	7
13,5	0	5	10	7
12,7	0,02	10	8,5	6
13	0,05	5	9,3	7
15,5	0,02	10	10,6	8
21,1	0,05	5	13,5	8
15,7	0,02	5	12,3	8
14,8	0,05	10	13,4	7
13,9	0,02	5	11,6	8
26	0,05	10	15,5	8
25	0,02	5	15,6	7
28,5	0,02	5	16,1	9
24,7	0,05	10	16,8	8
33,2	0,1	5	21,2	8

Table 1: Tabulation of measurements

Air temperature and water temperature:

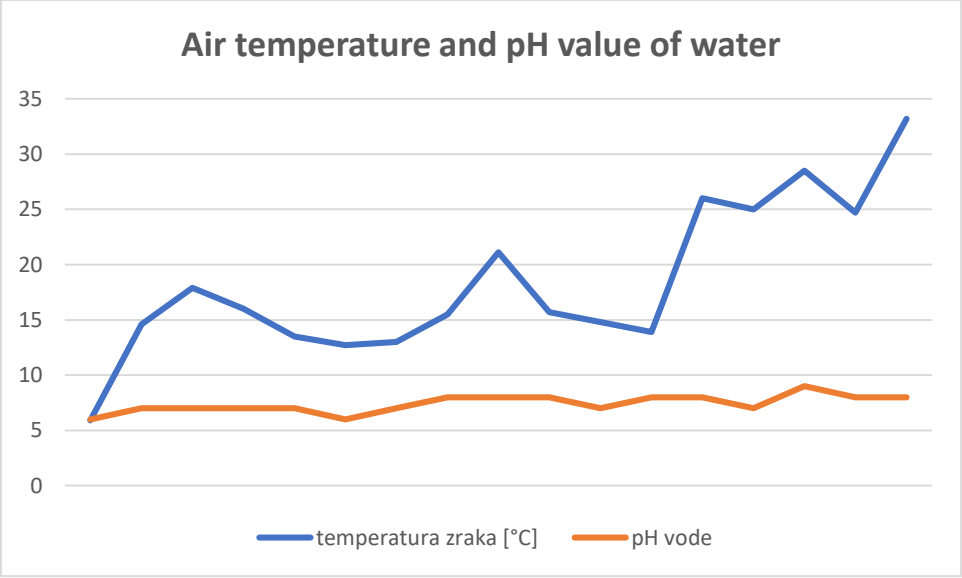
The graphs (Figure 1) show the variation of air temperature (blue line) and water temperature(orange line) over different time periods. We have observed that there is a clear correlation between these two variables, with water temperature increasing or decreasing in parallel with air temperature. Peak air temperatures tended to coincide with peak water temperatures. Water warms or cools more slowly than air.



Graph 1

Air temperature and pH value of water:

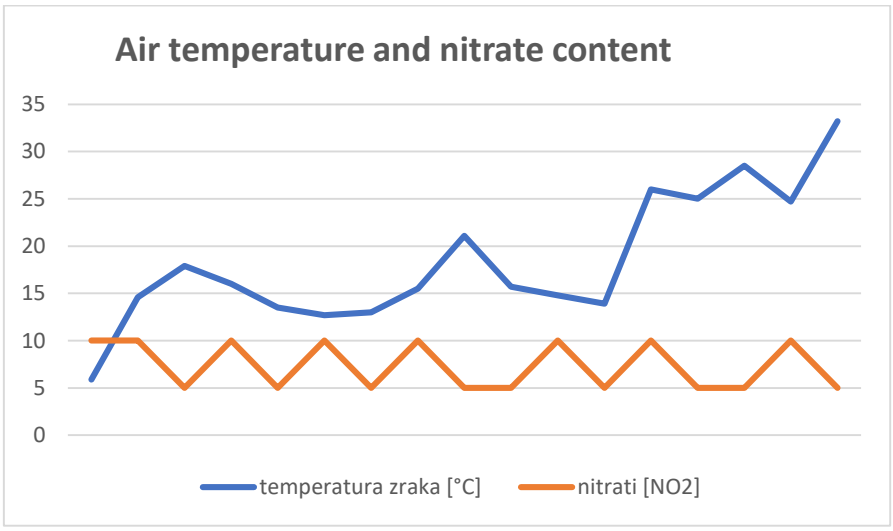
Graph 2 shows the relationship between air temperature(blue line) and water pH value (orange line). We found that there is no significant correlation between these two variables. Although the air temperature varies, the pH value of the water remains relatively constant.



Graph 2

Air temperature and nitrate content

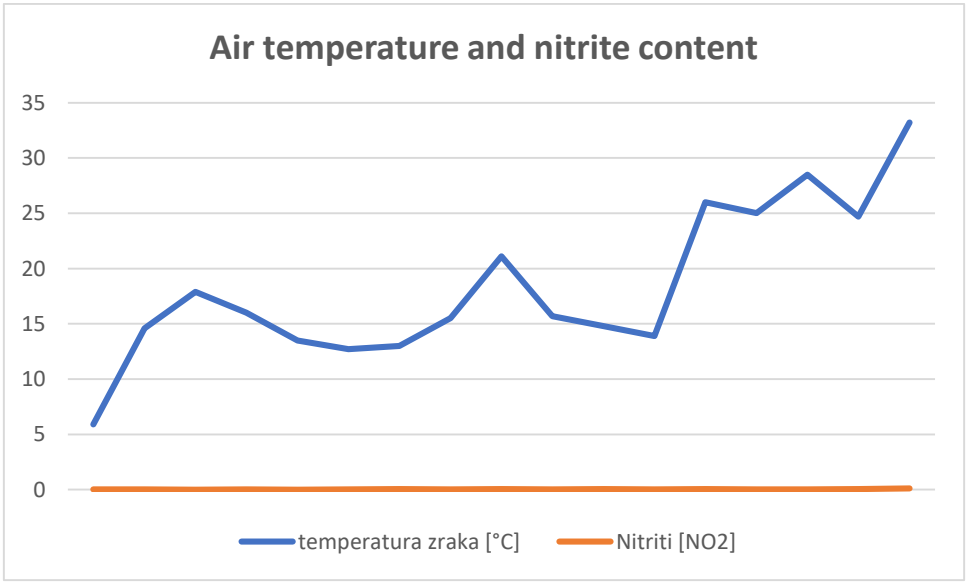
The results of the analysis show that there is no correlation between air temperature (blue line) and nitrate content (orange line). Higher air temperatures had no effect on the nitrate content of the water. This is clearly shown in graph 3.



Graph 3

Air temperature and nitrite content

As with the effect of air temperature (blue line) on nitrate content, temperature has no effect on the nitrite content of water.



Graph 4

6. ANSWERING THE RESEARCH QUESTIONS AND HYPOTHESES

Hypotheses:

Water temperature varies in correlation with air temperature:

Our results confirm this hypothesis. We observed a clear correlation between air temperature and water temperature. This indicates a close relationship between these two variables in the environment of the Tršljavec stream.

Air temperature does not affect the pH of the water:

Our data analysis showed that there is no significant change between air temperature and water pH. Despite the significant changes in air temperature, the pH value of the water did not change significantly. This indicates the relative stability of the chemical environment in the stream in relation to temperature changes.

The nitrate and nitrite content is dependent on air temperature:

The hypothesis is not true as air temperature does not affect the nitrate and nitrite content of the water.

7. CONCLUSION

Our study of the Tršljavec stream and the analysis of the data obtained have led to some important conclusions which shed light on the influence of air temperature on water temperature, pH value of the water and the nitrate and nitrite content. Our findings underline the importance of further monitoring and investigating the impact of environmental parameters such as air temperature on the ecosystem of the Tršljavec stream. Understanding these dynamics is crucial for the conservation of the ecosystem. Future research could include human activities in the vicinity of the stream, a wider measurement period and more locations, and a more detailed analysis of other environmental parameters, which would further contribute to the understanding of the relationship between the environment and life in the stream.