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Expression of catalase and glutathione-S- transferase in the liver of trout species as indication of stress in the Sava and Adige Rivers

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Introduction

The aim of this study was to determinate the activity of antioxidant enzyme catalase (CAT) and phase II metabolic enzyme glutathione-S-transferase (GST) in the liver of trout species from two sites at the upper stretch of the Sava River (Sava Bohinjka, downstream Bohinjska Bistrica and Radovljica) and three sites in the Adige River Basin (Vermigliana stream at Vermiglio, Noce at Mezzana and Noce at Mezzolombardo). Two basins are a part of the GLOBAQUA investigation approach (Navarro-Ortega et al., 2015) – Figure 1. Rising activity of CAT and GST is indicative for presence of stress factors - lack of oxygen and influence of an array of xenobiotics (Pavlović et al., 2004).

Material and Methods

The following trout taxa were used as sentinels organisms: *Salmo trutta* Linnaeus, 1758 (the Sava Basin), *S. marmoratus* and *S. cenerinus* Nardo, 1847 (the Adige Basin). Having in mind that collected taxa are closely related and have same ecological preferences, the data on activity of antioxidant and phase II metabolic enzymes is comparable. Due to the geographic distribution of trout species, it was not possible to collect the same taxa in two distinct river basins. Material for the analyses was collected and processed according to the standard procedure (Pavlović et al., 2004).

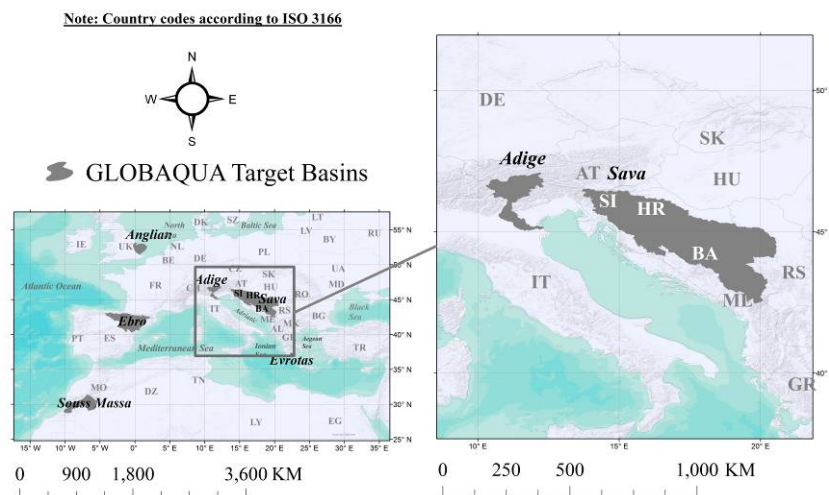
Results

Analyses of the activity of CAT and GST from the individuals from the Sava River did not show significant mutual difference, which is also the case with the activities of selected enzymes in individuals collected from the streams in the Adige River Basin. From the other side, statistical analysis showed that samples from the locality Sava Bohinjka had significantly higher hepatic GST activity in compare with all samples from the Adige Basin ($p < 0.001$, Anova, Tukey's post hoc test). Hepatic CAT also showed higher activity in individuals collected from the Sava than in those collected from the Adige River, but difference was not significant ($p < 0.05$).

Discussion

The results indicate that individuals of the trout species from the Sava River are under the higher influence of stress factors in compare to those collected from the Adige Basin. Having in mind that oxygen deficit was not recorded at investigated sites, the difference in enzymatic activity presented herein could indicate that the upper stretch of the Sava River is under higher influence of xenobiotics, in compare to streams investigated in the Adige Basin. Variation in activity of selected enzymes have been demonstrated in many studies and proposed as an effective marker of pollutant-mediated oxidative stress (Pavlović et al., 2004). The presence of pollutants and general degradation of certain sections of the Sava River have been discussed in previous studies (Milačić et al., 2015, Vrzel et al., 2016).

Figure 1: The position of target basins



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References

- Milačić, R., Sčančar, J., Paunović, M. (Eds.). *The Sava River*. Springer-Verlag Berlin Heidelberg, Series: The Handbook of Environmental Chemistry, (2015), 31, XIV, 506 p.
- Navarro-Ortega, A., Acuña, V., Bellin, A., Burek, P., Cassiani, G., Choukr-Allah, R., Dolédec, S., Elozegi, A., Ferrari, F., Ginebreda, A., Grathwohl, P., Jones, C., Ker Rault, Kasper Kok, P., Koundouri, P., Ludwig, R.P., Merz, R., Milacic, R., Muñoz, I., Nikulin, G., Paniconi, C., Paunović, M., Petrovic, M., Sabater, L., Sabater, S., Skoulikidis, N. Th. Slob, A., Teutsch, G., Voulvoulis, N., Barceló, D. *Managing the effects of multiple stressors on aquatic ecosystems under water scarcity. The GLOBAQUA Project*, Science of the Total Environment, (2015), 503-504, 3-9, DOI: 10.1016/j.scitotenv.2014.06.081.
- Pavlović, S., Bozinovski, D., Blagojević, D., Radojčić, R. Zikić, R., Saičić, Z., Grubor-Lajsic, G., Spasic, M. *Seasonal variations of cytosolic antioxidant enzyme activities in the liver and white muscle of thinlip gray mullet (Liza ramada Risso) from the Adriatic Sea*, Cryo letters, (2004), 25. 273-85
- Vrzel, J., Vuković-Gačić, B., Kolarević, S., Gačić, Z., Kračun-Kolarević, M., Kostić, J., Aborgiba, M., Farnleitner, A., Reischer, G., Linke, R., Paunović, M., Ogrinc, N. *Determination of the sources of nitrate and the microbiological sources of pollution in the Sava River Basin*, Science of the Total Environment, (2016), 573, 1460-1471, <http://dx.doi.org/10.1016/j.scitotenv.2016.07.213>