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What Causes Malformations in Freshwater Sponge Spicules? - Preliminary Research in Serbian Rivers

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Freshwater sponges (Porifera, Spongillidae) owing to some of their characteristics, may be exploited as bioindicators and, as such, are becoming increasingly interesting in ecological studies. Earlier studies have shown that environmental factors have a fundamental impact on Demospongiae spicule size and shape. However, data on spicule anomalies and possible causes of their appearance are quite scarce. The present study aimed to assess the frequency of spicule anomalies in sponges from 10 Serbian rivers, in relation to the species, physico-chemical properties of the streams and presence of pollutants.

In autumn of 2017, 40 sponge samples were collected in ten tributaries of Sava and Danube rivers (Velika Morava, Zapadna Morava, Juzna Morava, Tisa, Kolubara, Porecka River, Mlava, Beli Timok, Crni Timok and Nisava). Basic physico-chemical parameters were registered at every site where sponges were found. After spicule isolation by HNO₃ digestion procedure, the samples were subjected to morphological analysis by light and scanning electron microscopy, and number of anomalies recorded. For other parameters such as heavy metals concentration, nitrates, phosphates, carbonates, bicarbonates, dissolved silicates, etc. yearly values from the Environment Protection Agency were taken into consideration.

Five species were found: *Ephydatia fluviatilis*, *Ephydatia muelleri*, *Spongilla lacustris*, *Eunapius fragilis*, and *Trochospongilla horrida*. The most frequent anomalies were: spicule bending near one end, both ends, or medially, spicules with bifurcations and spicules with bulbous enlargements. The type and frequency of spicule malformations varied greatly within the analyzed specimens. The frequency of anomalies ranged from 1×10^{-3} to 67×10^{-3} , with an average number of 12×10^{-3} . Variations were noted in main physico-chemical parameters (the conductivity ranged from 364 to 603 μ S, the temperature from 12.3 to 21.9° C, the pH from 7.2 to 8.0 and the oxygen concentration from 7.07 to 11.3 mg/l). Similarly, the levels of different metals and other pollutants surveyed in the ten rivers varied considerably, but the permitted concentrations were not exceeded. The highest number of anomalies was found in a specimen of *E. fragilis* collected at Markovac (Great Morava River) and the lowest number was found in a specimen of *E. fluviatilis* from Kanjiza (Tisa River). Although the two “antipode” sites exhibited some differences in concentrations of bicarbonates, Fe, Cr, Ni, Mg, etc., none of the registered concentrations reached Intervention Values.io

From the present study it can be speculated that the propensity of sponges to display aberrant spicules will mostly depend on the species. Besides species-specific intrinsic factors, some exogenous factors are obviously also needed for the development of aberrant spicules, but it remains unclear what these environmental factors are. Some species seemed more tolerant than other to changes of water physico-chemical parameters.