Monitoring of Lake Baikal Pollution by Toxic Elements Using Endemic Sponges

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Designated a UNESCO World Heritage Site in 1996, Lake Baikal is the deepest lake in the world at 1642 meters and also the oldest, dating back 20-30 million years. Lake Baikal is known for its unique combination of freshwater and oceanic characteristics, such as thermal bars, stratification, seasonal homeothermy, currents, upwellings, downwellings, and deep convection. More than 60 % of the species found in Lake Baikal are endemic to the area. However, the lake has faced challenges in recent decades, with pollutants and toxic elements causing a decline in water quality and overall aquatic ecosystem health (Timoshkin, 2016).

Sponges are considered reliable indicators of environmental conditions due to their widespread distribution, diverse species composition, ability to absorb various microscopic particles and dissolved substances through filter feeding, tolerance to high levels of metals, and the availability of sufficient tissue for analysis (de Barros, 2013; Manconi and Pronzato, 2008). Endemic sponge species in Lake Baikal belong to the Lubomirskiidae family, which consists of four genera (Paradina et al., 2004).

In order to assess the potential use of endemic Baikal sponges as bioindicators for chemical element pollution, the elemental composition of *Lubomirskia baikalensis* body, water, and substrate samples obtained from two areas of Baikal Lake with differing levels of human activity (Bolshye Koty Bay and Listvennichny Bay) were analyzed. Neutron activation analysis and Inductively coupled plasma-atomic emission spectrometer were utilized for this purpose. The concentrations of Cl, Ca, V, Zn, As, Se, Ba, Cd, and Cu in sponges from Listvennichny Bay were found to be significantly higher compared to those from Bolshye Koty Bay. Pollution indices indicated slight to moderate pollution of the substrates. Results of bioaccumulation factor calculations suggested that sponges mainly accumulate Cd, Cu, and Br from the substrate, as well as other elements from water. The distribution of elements within the sponges and their variation within the species were also analyzed. Overall, it was shown that Lubomirskia baikalensis sponges are effective bioindicators for assessing toxic elements pollution in Lake Baikal.

References

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