

3.23.2 Metal bioaccumulation in macroinvertebrates: linking body burdens to the chemical and biological quality of water bodies

B. Sootmaekers, Systemic Physiological and Ecotoxicological Research (SPHERE), University of Antwerp / Department of Biology; G. Castaldo, University of Antwerp / Biology; R.M. Town, G. De Boeck, Systemic Physiological and Ecotoxicological Research (SPHERE), University of Antwerp / Department of Biology (SPHERE Research Group); S. Van Dongen, Evolutionary Ecology Group (EVECO), University of Antwerp / Department of Biology; R. Blust, L. Bervoets, University of Antwerp / Biology. Many surface waters nowadays remain under threat by ongoing human activities or historic contamination. Even under the obligations of the EU Water Framework Directive (WFD), numerous rivers and streams have poor chemical status, i.e. pollutant concentrations exceed the current Environmental Quality Standards (EQS). However, poor chemical status does not necessarily correspond to poor(er) ecological status of the water body. The overall ecological status, as defined by the WFD, comprises biological, hydromorphological and physicochemical quality elements. In the Flanders region of Belgium, the biological quality metrics include the Multimetric Macroinvertebrate Index of Flanders (MMIF); where an MMIF larger or equal to 0.7 is considered to be good. In terms of the chemical and biological quality metrics, a location may fall into one of four categories: (1) good biological quality + good chemical quality; (2) poor biological quality + poor chemical quality; (3) good biological quality + poor chemical quality (4) poor biological quality + good chemical quality. Our initial field study focused on the third scenario for the case of metal ions, i.e. the EQS is exceeded, but the biological quality (MMIF) is considered to be good. The dataset has then been expanded to include all four scenarios, covering a total of 26 locations and more than 25 taxa. Others have already focused on the relationship between bioaccumulation in macroinvertebrates and the ambient total dissolved concentrations, or described changing community metrics with environmental concentrations. However, few have made a direct link between biological quality and macroinvertebrate metal bioaccumulation. As is often the case, rivers and streams are not only subjected to a single stressor; the ecological status derives from the overall habitat quality, which is affected by many interdependent physical and chemical factors, including e.g. hydrodynamic conditions in the water body, suspended particulate matter, dissolved oxygen, light intensity,... By characterizing the exposure patterns in terms of metal speciation in the water (dissolved, total, free M^{n+} , modeled) and the sediment (total, Simultaneously Extracted Metals - SEM, Acid Volatile Sulfides - AVS), we are investigating (i) whether biological quality can be partially explained by bioaccumulation, and (ii) if the chemical speciation in the exposure medium is related to the bioaccumulation in macroinvertebrates.