

## Ecological Risk Assessment of Heavy Metals to Freshwater Benthic Macroinvertebrate Assemblages Based on Field Survey in the Hasama River Basin, Miyagi, Japan

Y. Iwasaki<sup>1</sup>; T. Kagaya<sup>3</sup>; K. Miyamoto<sup>2</sup>; H. Matsuda<sup>1</sup>

1. Graduate School of Environment and Information Sciences, Yokohama National University, Yokohama, Japan.
2. Research Center for Chemical Risk Management, National Institute of Advanced Industrial Science and Technology, Tsukuba, Japan.
3. Graduate School of Agricultural and Life Sciences, The University of Tokyo, Tokyo, Japan.

Environmental standards in Japan for water quality of zinc on aquatic organisms were set in November, 2003. The standard zinc concentration in the freshwater environment is 30 $\mu$ g/L determined by the chronic toxicity of a mayfly *Epeorus latifolium*. In order to examine the validity of this standard concentration, we assessed ecological risks of heavy metals to riverine benthic macroinvertebrate assemblages by a field survey. We measured physicochemical characteristics, heavy-metal concentrations, and benthic macroinvertebrate assemblage structures at 9 riffle sites in the Hasama river basin in which the Hosokura mine (closed in 1987) was located. The range of zinc concentrations in these sites was 2-921  $\mu$ g/L. Taxon richness, abundance and biomass of dominant benthic macroinvertebrate taxa were analyzed using two statistical analyses: analyses of variance and multiple linear regressions. By these analyses, we evaluated the effects of the heavy metal pollution on macroinvertebrates. Ephemeroptera and Trichoptera richness, and abundance of many taxa (29-48%) significantly decreased due to the existence of the heavy metal pollution and with increasing heavy-metal concentrations. The effects on mayflies were particularly remarkable, suggesting that Ephemeroptera contains more species sensitive to heavy metals than any other orders. On the other hand, some Diptera taxa significantly increased with heavy-metal concentrations. The results suggested that typical benthic macroinvertebrate assemblages appeared at the station where the zinc concentration was detected approximately twice as much as the standard concentration.