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Impacts of pesticide mixtures in European rivers as predicted by the Species Sensitivity Distribution (SSD) models and SPEAR bioindication

Sona Jesenska (1), Mathias Liess (2), Ralf Schäfer (2), Mikhail Beketov (2), and Ludek Blaha (1)
(1) RECETOX, Masaryk University, Brno, Czech Republic (blaha@recetox.muni.cz), (2) UFZ, Leipzig, Germany

Species sensitivity distribution (SSD) is statistical method broadly used in the ecotoxicological risk assessment of chemicals. Originally it has been used for prospective risk assessment of single substances but nowadays it is becoming more important also in the retrospective risk assessment of mixtures, including the catchment scale. In the present work, SSD predictions (impacts of mixtures consisting of 25 pesticides; data from several catchments in Germany, France and Finland) were compared with SPEAR-pesticides, which a bioindicator index based on biological traits responsive to the effects of pesticides and post-contamination recovery. The results showed statistically significant correlations (Pearson's R, $p<0.01$) between SSD (predicted msPAF values) and values of SPEAR-pesticides (based on field biomonitoring observations). Comparisons of the thresholds established for the SSD and SPEAR approaches (SPEAR-pesticides=45%, i.e. LOEC level, and msPAF = 0.05 for SSD, i.e. HC5) showed that use of chronic toxicity data significantly improved the agreement between the two methods but the SPEAR-pesticides index was still more sensitive. Taken together, the validation study shows good potential of SSD models in predicting the real impacts of micropollutant mixtures on natural communities of aquatic biota.