The use of the Sediment Quality Triad for quality assessment of freshwater sediments in Northern Spain

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Introduction: The basin management plans in Spanish rivers provide important chemical and biological information on the ecological status of rivers. However, an integrated ecological risk assessment would require additional information on sediment toxicity. A weight of evidence (WOE) framework integrates and interprets different lines of evidence (LOE) (1) in order to determinate possible ecological impacts. One of the first sediment quality WOE frameworks was the Sediment Quality Triad (SQT), which involves at least three LOE (2, 3) although other approaches including other kind of variables have been proposed (e.g. 4-6). The main objective of the present study is to provide a screening-level of the ecological risk assessment of freshwater sediments using sediment chemistry, benthic community and sediment toxicity data. This study will enable to evaluate the contribution of data on sediment toxicity to the sediment quality assessment performed by the Water-Quality Surveillance Networks (WQSN) based on sediment chemistry.

Methods: Sampling sites were chosen from those established by Water Agencies for WQSN in rivers of the Basque Country, Cantabria and the Ebro basin (Northern Spain). These networks provided data on sediment chemistry and on benthic infaunal composition and structure (data available to the public). The sediment toxicological data were obtained through the aquatic oligochaete *Tubifex tubifex* (Annelida, Clitellata) 28-day sediment chronic bioassay (some results published in 6). The American Society for Testing and Materials Standard Guide (8) was followed with minor modifications to perform the chronic sediment bioassay with *T. tubiufex* (9, 10), that includes survival and reproduction as endpoints, as well as cocoon and adult biomass. The general approach to calculate and interpret the Triad components (11) was followed and some modifications were included for data normalization. Thus, chemical data were normalized by sediment quality guidelines, the biotic component by the threshold value for the reference condition in each ecoregion, and the toxic component by a percentile value of each endpoint at reference sites (12) in order to build the decision matrix.

Results: Sediment quality assessment obtained from data on sediment metal concentrations, the Iberian BMWP score, and the sediment chronic toxicity of 70 sediments is presented through different case studies chosen among reference and polluted sites using the SQT approach. Furthermore, sediments are re-evaluated in the light of the integrated assessment.

Discussion: The need of a consensus between different Water Agencies is stressed. Standardization of methods and general criteria for the measurement of variables in the Surveillance Networks are also required for the determination of the reference condition into ecoregions shared by different Water Agencies. This lack of consensus difficults an integrated sediment quality assessment of river watersheds. The SQT used in the present study is performed as a first approach to the sediment quality assessment before the application of the Reference Condition Approach based on multivariate analyses (e.g.13, 14).

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