

Surface Sediment Quality Assessment in a Coastal Lagoon (NW Adriatic Sea) Based on SEM-AVS Analysis

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Abstract : Surface sediments from the coastal lagoon of Pialassa Piomboni in the NW Adriatic Sea were collected and analysed and the potential ecological risks in the area were assessed based on the acid-volatile sulphide (AVS) model. The AVS levels are between 0.03 and 8.8 $\mu\text{mol g}^{-1}$, with the average at 3.1 $\mu\text{mol g}^{-1}$. The simultaneously extracted metals (ΣSEM), which is the molar sum of Cd, Cu, Ni, Pb, and Zn, range from 0.3 to 6.6 $\mu\text{mol g}^{-1}$, with the average at 1.7 $\mu\text{mol g}^{-1}$. Most of the high ΣSEM concentrations are located in the southern area of the lagoon. [SEM]Zn had the comparatively high mean concentration (1.4 $\mu\text{mol g}^{-1}$), and a maximum value of 6.1 $\mu\text{mol g}^{-1}$, respectively. Concentrations of [SEM]Cd, [SEM]Cu, [SEM]Ni, and [SEM]Pb were consistently lower, with maximum values of 0.007 $\mu\text{mol g}^{-1}$, 1.4 $\mu\text{mol g}^{-1}$, 0.3 $\mu\text{mol g}^{-1}$ and 0.2 $\mu\text{mol g}^{-1}$, respectively. Compared to other metals, [SEM]Zn was the dominant component in all samples and accounted for approximately 31 - 93% of the ΣSEM , whereas the contribution of Cd - the most toxic metal studied - to ΣSEM was no more than 1%. According to the USEPA evaluation method, the sediment samples can be divided into the three following categories: category 1, adverse biological effects on aquatic life may be expected when $([\text{SEM}] - [\text{AVS}]) / \text{FOC} > 3000$; category 2, adverse effects on aquatic life are uncertain when $([\text{SEM}] - [\text{AVS}]) / \text{FOC} = 130$ to 3,000; and category 3, no indication of adverse effects when $([\text{SEM}] - [\text{AVS}]) / \text{FOC} < 130$. Most of the surface sediments of the Pialassa Piomboni lagoon (>90%) had no adverse biological effects according to the criterion proposed by the USEPA; while adverse effects were uncertain in few stations (~2%).

Keywords : sediment quality, heavy metals, coastal lagoon, bioavailability, SEM, AVS

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