

French and Norwegian sediment quality guidelines comparison

- case study in the NE Adriatic Sea, Croatia

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Introduction: The eastern coast of the Adriatic Sea that belongs to Croatia is 1,777 km of the land line and in total more than 6,000 km including coasts of islands. Aimed at assessing and maintaining GES (Good Environmental Status) as obliged by European regulations, Croatia conducted an initial assessment of the state of the marine environment which defines ecotoxic metals and persistent organic pollutants present in the water column, sediment and in biota (shellfish *Mytilus galloprovincialis*) [1]. The threshold values that separate acceptable from unacceptable status have not been determined for marine sediments.



Fig. 1: Location of the Sampling Sites in NE Adriatic Sea: S1 - Local Harbour, S2 - Shipyard, S3 - Lim Bay Out, S4 - Lim Bay Middle and S5 - Open Sea (3 NM in Front of the Town of Rovinj).

Methods: The authors assessed the state of marine sediment at five stations of Rovinj NE Adriatic Sea (Fig.1.), differently exposed to anthropogenic influence applying the French regulation for dredged sediments with N1, N2 thresholds [2,3] and Norwegian criteria [4] that distinguish five categories of polluted sediment with regard to the achieved biological effect (*background, good, moderate, bad, very bad*). The samples were collected in August 2011 by Ven Veen grab (6 m - 30 m depth). The surface layers (3 cm - 5 cm) were subsampled and separated for sediment grain size analysis by wet sieving using the set of Retsch 7 sieves (4 mm, 2 mm, 1 mm, 0.5

mm, 0.25 mm, 0.125 mm and 0.063 mm), chemical analysis of concentrations of the metals (As, Cd, Cu, Ni, Pb, Zn, Hg, Cr), PAH compounds, PCB (Arocolor 1260) and phytotoxicity assay (*Linum usitatissimum* seed germination, biomass production and root inhibition growth). Before the analyses performed the samples were defrosted from (-80°C), dried (70°C) and weight.

Results and Discussion: The comparison of the threshold values of the ecotoxic metals, PAH compounds and PCBs shows that the categories of the Norwegian criteria *bad* and *very bad* are significantly above the French regulation threshold N2. By comparing the results of concentrations of the metals, PAHs and PCBs in marine sediment samples according to the French regulation, the metals Cu, Ni and Cr slightly exceeded N1 values in the harbour, while Hg exceeded N2 value (0.838 mg/kg d.w.). The concentration of total PAHs at the harbour, marina and Lim out stations ranged between N1 and N2 (1.5 - 15 mg/kg d.w.). All stations showed concentrations of PCBs in the sediment samples below the N1. The calculation of a probability of a toxic effect showed that the average toxic effect quotient (QPEC) [2,5] classified the Rovinj harbour and the Rovinj marina stations as potentially toxic for biota.

Conclusion: Although the French regulation has lower thresholds than the Norwegian criteria, therefore stricter for contaminated sediments intended for further use, the later is more suitable for differentiation of less polluted marine sediments.

References:

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