



1 The elemental composition of sediments of the harbour basin of Zadar (Croatia) – geological sources and contaminations

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Settlement in Zadar harbour area started in prehistoric times. Sediment samples which were taken for an investigation of selected POPs (PCBs, PCDDs/Fs, OCPs) in water ecosystems from waste materials, were used to monitor possible hazards from metal contaminations.

The marine sediments were sampled from a motor-boat by means of a gravity corer in the harbour of Zadar. Samples of two different depths (mostly 0 – 2 and 2 – 10 cm) were taken. A total of 38 samples and additional two profiles were digested with reverse aqua regia ($\text{HNO}_3 + \text{HCl} = 3+1$) under reflux, filtered, and submitted to ICP-OES and ICP-MS multi-element determinations for a total of 30 elements. Some bromine was added to keep platinum, iridium and gold in solution also.

The harbour sediments of the *Marina (u. Vrulje)* and the *Jazine* (area of about 0.18 km²) are characterised by black fine grained silt, rich in TOC (2.5-8 %). Variable amounts of carbonate minerals as calcite and aragonite and silicates (quartz, illite-mica) occur. From this, main element composition indicates a broad spectrum from basic via acid silicates to limestones. Nutrient P and K were at moderate levels. Some spots highly contaminated with Cd, Cr, Cu, Pb, and Zn were found, and one site was extraordinary high in Au-Hg-Bi and phosphorus also. The contaminations were independent from main element compositions (Al, Ca, Fe). The element concentrations of (in alphabetical order) As-Co-Fe-Mn-Tl-V showed Gaussian distributions. In addi-

tion, the frequency distributions of concentrations of Al, Be, Li, Ni, Pt, Sn, and Pt were symmetrical. Ba, Be, Ni, V, Pt, and Ir were encountered at ambient levels. Iridium was at the limit of detection.

Within the 2 sediment profiles, no clear increase of trace element contents towards smaller grain sizes was seen, as expected from diffuse source inputs, but a minimum in the 40-60 μm fraction, and maxima of contaminant Cu-Pb-Zn in the coarsest fractions.